JANUARY 1964 | 50c

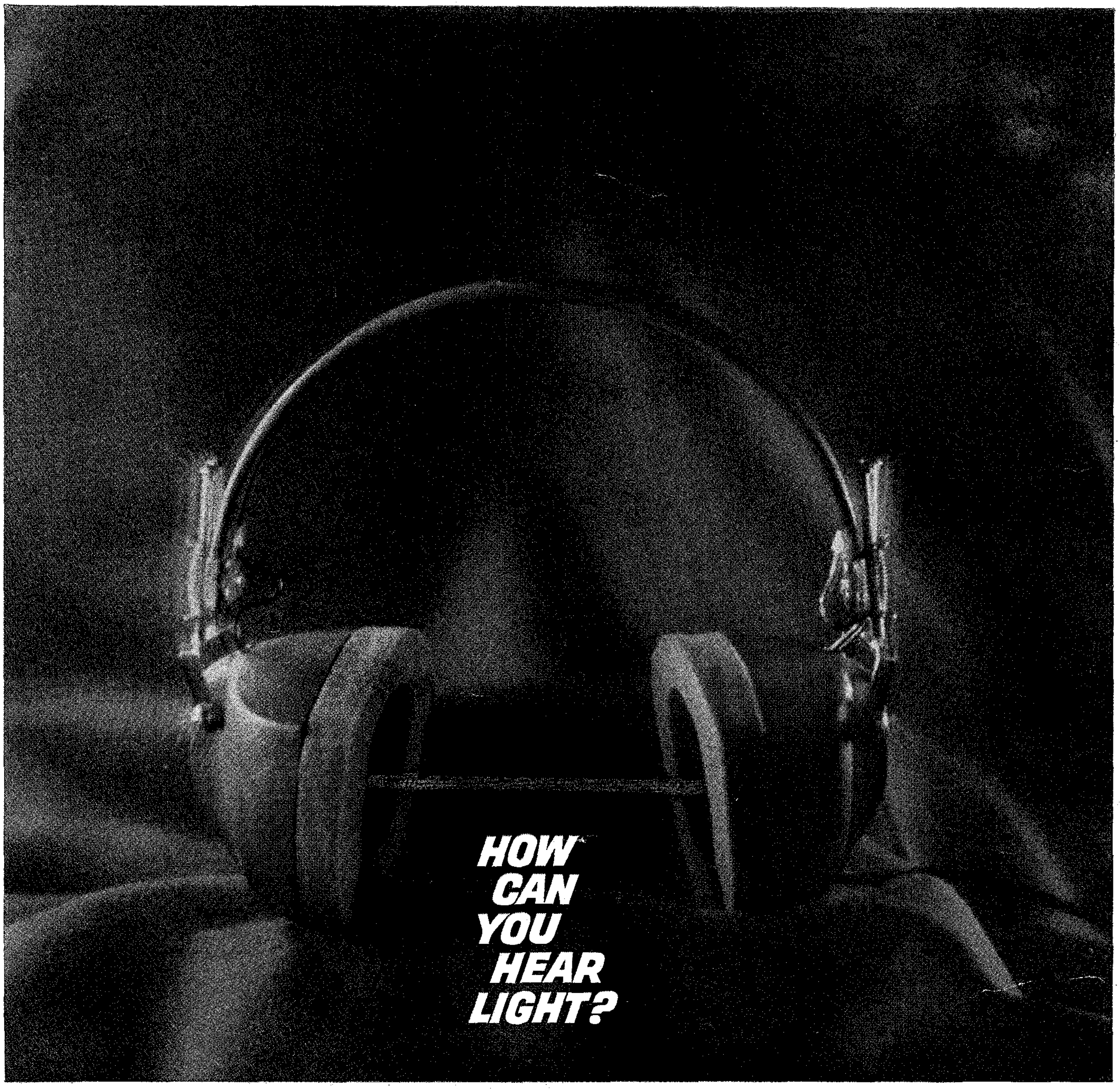
# analog

SCIENCE FACT ⟶ SCIENCE FICTION

POLARIZED LIGHT THROUGH A MICROSLICE OF METEORITE

**SECONDARY METEORITES** | BY RALPH A. HALL, M. D.

EVIDENCE THAT SOME OF THE STONES THAT FALL TO EARTH MAY WELL HAVE COME FROM MARS . . . GANYMEDE . . . AND EARTH ITSELF



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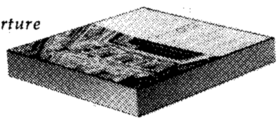

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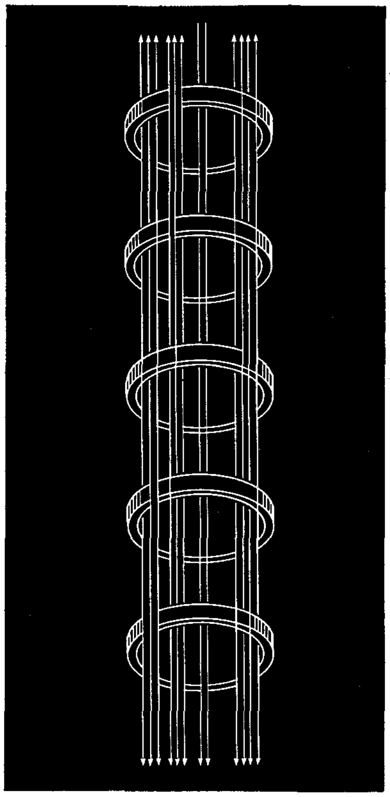

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# analog
## SCIENCE FACT - SCIENCE FICTION

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**Our Cover:** The cathedral-window effect on our Christmas cover is, in fact, an Ektachrome transparency of polarized light coming through a microthin slice of the meteorite which fell near Nakla, Egypt, in 1911. Photographed by Ralph Hall.

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COVER BY RALPH A. HALL, M.D.

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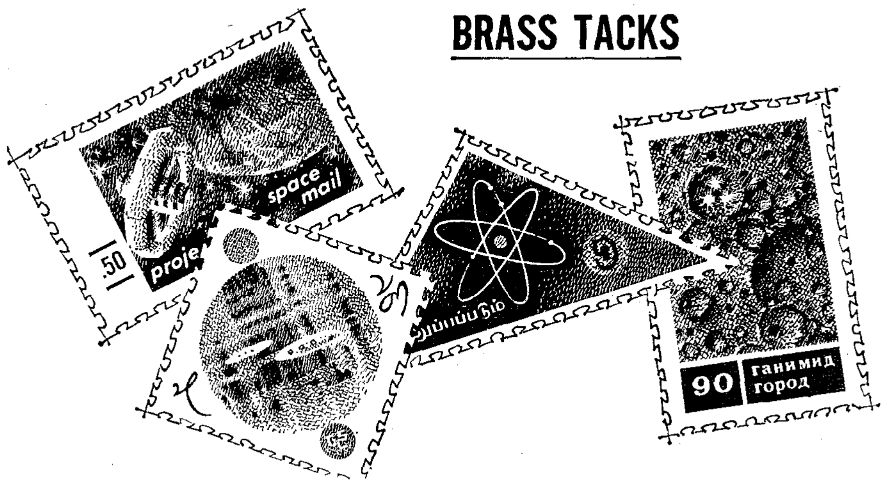
# BRASS TACKS



Dear Mr. Campbell:

I find your editorials always thought-provoking, but your last one provoked some adverse thoughts. You state that the Earth is a freak planet. What makes you think this? There is no reason why every star-system is not provided with one or more similar systems. You state that Mars' atmosphere is transparent because of its thinness, similar to the case on our own planet. Put Mars in Earth's orbit, equip it with large seas, replace the more noxious elements of the atmosphere and planetary surface with the ones more beneficial to life-as-we-know-it, and you have Earth, slightly smaller, but equally capable of supporting life. Science would arise because the planets transparent atmosphere would permit astronomy. Electromagnetic rays would become the major form of long-range communication and the interference because of interstellar radio static would be discovered. The inhabitants would speculate on the possibility of life on alien star systems. Thus a similar civilization, incorporating beings similar to ourselves, would grow in an alien star system, probably in more than one. The need for a binary planet is not there.

I find your statements on Venus' planetary conditions most interesting. Imagine an unsuspecting astronaut—or cosmonaut—making a planetfall on Venus. He slips into one of those thousand mile-an-hour jetstreams and zing! he's not there. Postulate a civilization that grew up on Venus millions of years ago. At that time the greenhouse effect has not had such a dramatic effect. The temperature is a comfortable 90-125 above. The scientists, looking back over their records note a distinct upward trend in the temperature of the planet. The trend is dismissed as merely part of the ups and downs of weather. But several thousand years later the trend is more pronounced and the inevitable doom is foreseen. The scientists of the planet can't see where the heat comes from, for all they know an eternal flame burns high above, unseen through the dense atmosphere. They can't conceive of spaceflight because they can't see the goal. The increasing heat forces life to de-evolve and take to the sky. The cities rot and crumble. Milennia later Earthmen land and wonder how life could evolve in the atmosphere of a planet.

DWIGHT WILCOX
12971 Nash Road,
Los Altos, California.

*"Equip Mars with great seas . . ." is easy to say, but the evidence suggests that it ain't so easy to do! The small planet doesn't have gravity-field enough to retain hydrogen; nearer the heat-source, it'll have even less chance of retaining water. It'll have a clear "atmosphere" all right . . . but a pretty vacuous atmosphere!*

Dear Mr. Campbell:

About your editorial in the June issue: "Shakespeare never used "yes";

the word had not been introduced into the language in his time." Please examine "Measure for Measure" II, iii, 25.—Duk. Love you the man that wrong'd you?

Jul. Yes, as I love the woman that wrong'd him.

"The Merry Wives of Windsor," II, ii, 108—

Surely I thinke you have charmes, la: yes in truth.

"Henry VII" I, ii, 176—

I say, take heed; Yes, heartily beseech you.

What appears to be an early form of the word appears in Aelfric's *Homilies,* I. 14: "Hwi! wolde God swa lytles kinges him forwyrnan . . . ? Yse; hu michte Adan tocnawan . . ." This was written circa 1000 A. D.

As for *wrought,* this is the old past participle of the verb whose infinitive form is "to work." It was the ordinary form of the word until "worked" began replacing it some five centuries ago.

Herbert Gilliland
324 N. W. 24th Street,
Gainesville, Florida

*One of VERY numerous letters pointing out that Shakespeare did use "Yes." But ordinary dictionaries of circa 1800 do not list it.*

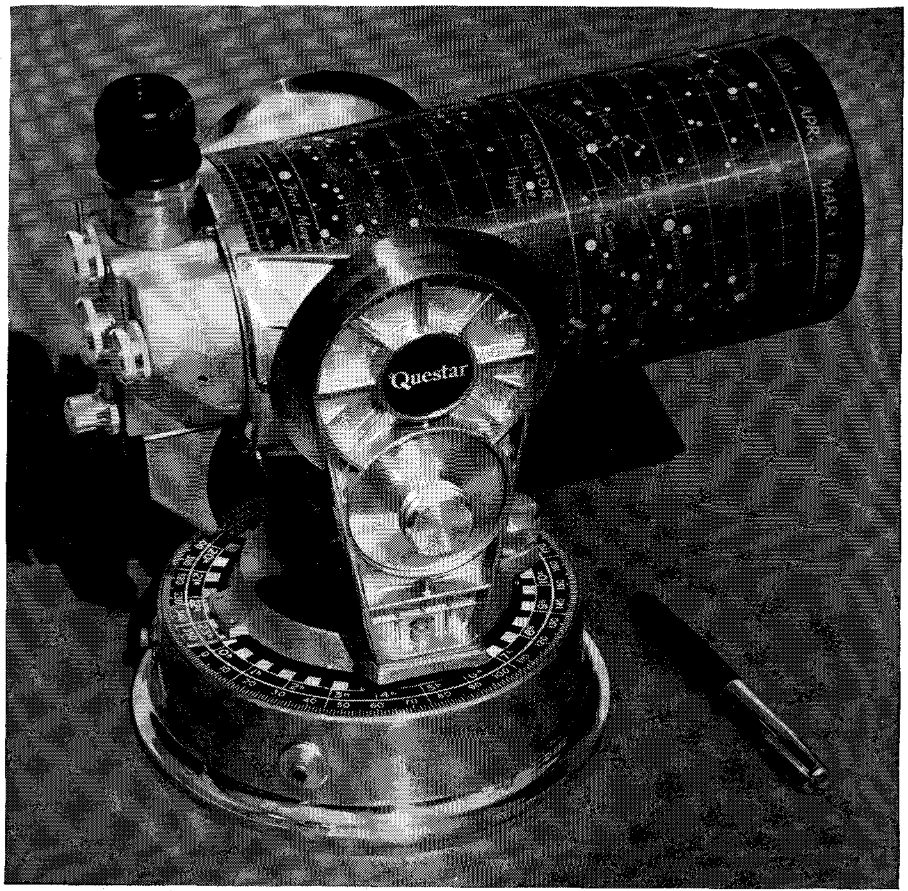
Dear John:

About the origins of Wells' "The Time Machine":

It began as an unfinished serial, "The Chronic Argonauts," published in the *Science Schools Journal*—of which Wells himself had been a founder and the first editor—for April, May, and June, 1888. This first version is full of melodramatic claptrap about unsolved murders, a haunted Manse, mysterious disappearances, a mob of superstitious Welsh villagers, and a villainous hero named Moses Nebogipfel; though the time machine is described, there is no real glimpse of the future.

By 1892, Wells had made two revisions of the story. Though these have been lost, Wells read parts of them to a college friend, A. Morley Davies, whose description is quoted by Geoffrey West. In the first, Nebogipfel does

continued on page 91



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Questar introduced the new optics to the world in this daringly short design in May, 1954, after 8 years of research and development. Since then its performance has astonished everyone, including us who make it. It has firmly established the superfine telescope on a new level of serious respect. And it has made this company not only the world's largest manufacturer of short catadioptric telescopes but the only maker of f/2 Cassegrain high-power optical systems.

*These paragraphs open the 23-page Questar booklet which is illustrated by some astonishing photographs, showing 1- and 2-second detail, that let the instrument's high performance speak for itself. May we send you a copy? Questar costs only $995 in English fitted leather case and is sold only direct at one factory price.*

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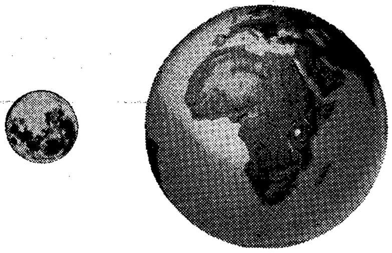

# NEW HOPE FOR UNDER-DEVELOPED NATIONS RESULTING FROM BASIC SPACE RESEARCH

Lunar and space missions such as Project Apollo seldom seem, in their far-out glamour role, to be closely related to that great fundamental... mankind. Yet one single aspect of the Apollo program —fuel cells—holds a vast amount of hope. Especially for under-developed nations.

Often referred to as "continuous batteries," fuel cells convert chemical energy directly to electrical. They are the newest power sources to emerge from scientific research into the realm of practical engines. The specific cell system aboard Apollo will be a Hydrox® unit, reacting hydrogen and oxygen, and is the result of research at Leesona Moos Laboratories, one of the first in America to undertake studies on fuel cells. Hydrox will supply electrical power for vehicle control, communications, and numerous other power needs aboard this lunar mission. Marking the first such use of these new power sources, the Hydrox installation will inaugurate a new age in the generation of electrical power. Final engineering and manufacture of the units for Project Apollo will be carried out by Pratt & Whitney Division of United Aircraft, under license from Leesona Corporation.

But space missions are only the first part of the story. At the same point in time that Leesona Moos began studies of Hydrox fuel cells, a concomitant project was undertaken to develop an even more advanced system... a cell using air as oxidant and inexpensive hydrocarbons or their derivatives as fuels. These hydrocarbon-air (Carbox®) and mixed-gas/air (Aminox™) developments of Leesona Moos do not require reactants of high purity, and are very flexible from a logistics point of view. Low cost and readily available fuels are used, and the universal oxidizer—air—supplies the other portion of the reaction mix. Because the fuel cell is an extremely efficient engine—efficiencies of up to 70% are attainable, vs. 30% for a conventional diesel—the result is an exciting new means of generating electrical power at low operating expenditure. Pratt & Whitney Aircraft in the United States, and Energy Conversion Ltd.,* of England, are carrying out further developmental engineering on these systems under license from the Leesona Corporation.

These new Leesona power sources, of high efficiency and low fuel costs, can readily be seen to provide the world with an entirely new type of electric generator. Fuels of the hydrocarbon variety are fairly abundant throughout the world. The fuel cell, though scientifically sophisticated, is neither unwieldy nor complex in its operation, and requires little maintenance. Units with power levels from those required for a one-family dwelling up to communal or industrial ground-power stations have been projected in Leesona Moos studies, and found feasible.

The impact Carbox and Aminox can have on the emerging countries is readily understandable. The development of a nation can almost be measured by its ability to produce and consume electrical power. In this mechanized world, virtually all industry waits on the availability of electricity. If an emergent economy must hold off its development until completion of large-scale hydroelectric projects, a distinct problem of time and expenditures arises. If, on the other hand, the nation had access to Carbox and Aminox type fuel cell systems, which could be tailored to the need and would operate on locally available fuels, the basic first step toward an industrialized economy and higher living standards would be achieved.

Leesona believes its efforts, plus the great additive capabilities of our United States and international partners, will soon result in working installations of the Carbox and Aminox systems to advance the standards of all mankind. Meanwhile, the sibling Hydrox system supplies power for a moon voyage. And research continues.

◆

**Energy Conversion, Ltd., is a new corporation founded by four British companies: National Research and Development Corporation; British Petroleum Company, Ltd.; British Ropes, Ltd., leading manufacturer of rope and steel cable; and Guest, Keen, and Nettlefolds Group, major steel manufacturers.*

LEESONA MOOS

# LEESONA MOOS LABORATORIES

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One of the major faults I find with the "scientific approach" to problems is the powerful tendency to hold that that-which-is-known necessarily embraces all-that-is-possible. Stated in that form, of course, any scientist would immediately deny it; it's normally stated in reverse form—i.e., "nothing known can produce such effects, so it is clearly a hoax, misobservation, or fraud."

I've been interested for some years in watching the case of *Krebiozen,* a cancer-treatment that has been vigorously attacked by the AMA—as have all cancer treatments other than their accepted, standard procedures of radiation, surgery, and caustics. There's been a running battle for years between the doctors who have used the stuff and believe they have clear evidence it works, and the AMA people who have not used it and insist it doesn't work.

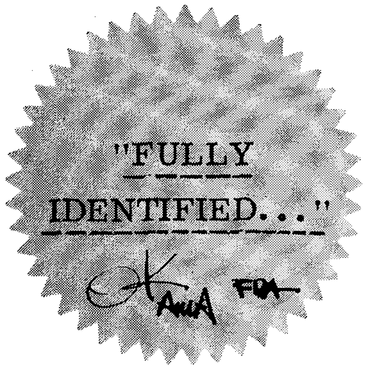
For a long time, the Krebiozen faction refused, or claimed to be unable to supply a purified sample of their material for AMA-sponsored analysis; they demanded that the AMA make what amounts to a biological assay test—i.e., run a standard double-blind test of the effectiveness of the remedy in actual cancer cases. In a double-blind test, neither the doctor nor the patient knows which individuals are getting the test-drug, and which are getting blank solutions; only a central computer has the number-correlations that finally match results with identification. This is the one type of test that assures that subjective factors will not influence either the patient's reactions, nor the doctor's evaluations.

The new drug laws—resulting in part from the thalidomide furore—finally made it possible for the AMA, working through the Federal Drug Administration, to force the Krebiozen faction to supply a concentrate of their material for chemical analysis.

Chemical analysis has many powerful tools these days; infrared spectroscopy shortly permitted identification. The infrared spectrum of the Krebiozen sample was shown to match, one-to-one, the infrared spectrum of a well-known protein component of muscle tissue—*creatine.* The effects of creatine being well known—none whatever—it was at once clear that Krebiozen could not have any useful effects, as the AMA had long maintained.

There is, it seems to me, just one slight hitch in that simple-minded conclusion.

I am prepared to supply an extremely effective herbicide which I can positively guarantee can be shown by the most careful chemical analysis to consist of extremely pure water. "Conductivity water," in fact—water so extremely purified that it does not conduct electricity. There will be less than 0.001 parts per million of impurity in it. And chemical analytical techniques haven't even started to get good enough to reach that level of analysis!



**EDITORIAL BY**
**JOHN W. CAMPBELL**

Which seems sort of contradictory, in view of the fact that certain impurities in water, present in concentration of about $10^{-15}$ are legally defined as making the water "impure." And I am not talking about radioactives, either —perfectly ordinary chemical compounds of stable elements.

My herbicide belongs to the same type-class; a concentration of $10^{-18}$ or so would be quite adequate to ruin a field of growing plants. Readily proven by biological assay . . . but some *ten orders of magnitude* beyond the reach of chemical analysis!

How? Well, starting with conductivity water, I need add only a very minute trace of a known crystalline material—tobacco mosaic virus. The resultant solution, sprayed on young tobacco plants, could do quite a job, couldn't it?

And the legal definition of impure water has to do with the permissible concentration of *bacteria coli* in the water. Anyone want to try to spot that quantity of complex protein by *chemical* analysis?

So Krebiozen contains creatine? Well, well . . . And what else does it contain? Probably some hydrogen oxide too, I betcha. Since it's extracted from horse serum, it's quite apt to contain a couple of oddments of metabolic processes. Horses being noted for their quantity of muscle tissue, the presence of a muscle tissue extract of no significance isn't too startling, really. And since the mighty powers of modern chemical analysis can't find anything else present, that proves that creatine is all that's there.

Look friends . . . I have a bottle of a nice clear solution that should improve the situation for chemists who think like that. They're free to analyze it to their hearts content . . . if only they'll drink it after they've "proven" it has nothing of any significance in it. Lessee now . . . we could load it with botulinus spores . . . or concentrated polio virus . . . or even anthrax spores; then we could let him boil it for an hour before swallowing it, and still the damn fool would have personal experience with the fact that the limits of his knowledge and talents are *not* the limits of reality.

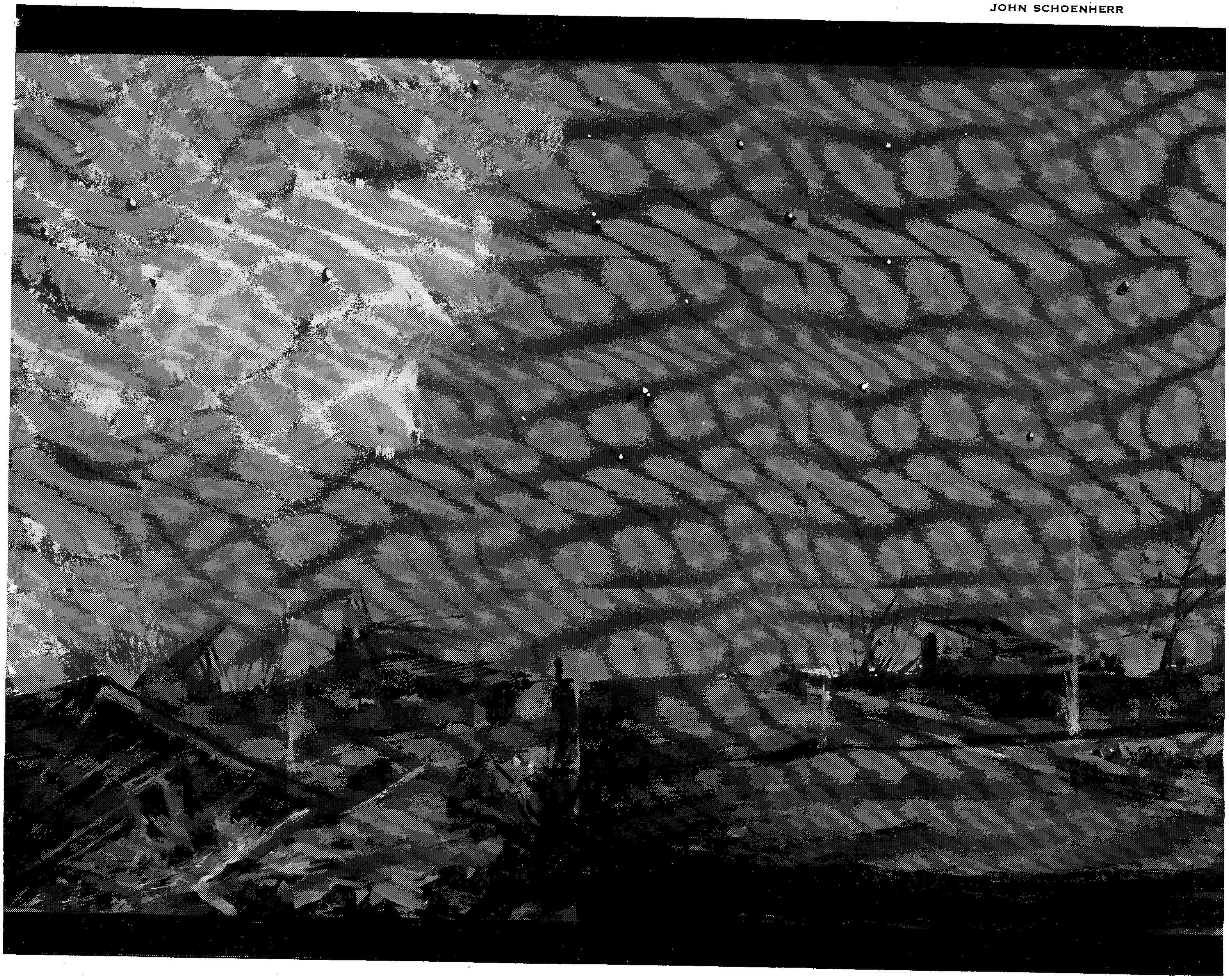
I have no personal interest in Krebiozen; I do have an acute personal, as well as citizenship interest in the honesty of thinking of science and medicine.

Anyone in a field of medical-biological work who considers, even temporarily, that chemical analysis is adequate for the determination of an unknown remedy is inexcusably incompetent, dishonest, or muddleheaded beyond toleration.

To consider that spectrum identification is an adequate tool for such work is even further in the direction of fantastic — appalling! — irresponsibility. Obviously spectrum identification

*continued on page 95*

JOHN SCHOENHERR



**If a big one hits** A meteorite two kilometers in diameter has fallen two-hundred kilometers away. An orange-brown mushroom cloud is rising beyond the horizon. Orange flames leap up through the throat which is 45 kilometers in diameter. It is a million times as powerful as the fifty megaton bomb. Tiny bright nickel-iron spherules are raining all around. Ground water leaps in geysers from lawns and streets. The "Hot Line" must work tonight, or this won't be the worst!

*There is strongly suggestive evidence that many of the stones-from-the-stars that fall to Earth may, in fact, be secondary splatter from the impact of giant primary meteor impacts. But not just from Earth or Lunar impacts! Some may be bits of Mars, Ganymede, or Venus. . .*

## *Prologue*

Nothing could be more dramatic than to witness the fall of a great meteorite. By this I mean a bolide of nickel-iron say: two kilometers in diameter. Imagine yourself, if you will, standing on a small prominence in the landscape so that you can look down a broad boulevard over a slight slope of the terrain. You have a fairly clear view of the sky and horizon thirty kilometers away. Let us imagine that this meteorite is going to strike two hundred kilometers away. Allow that you have an active interest in astronomy and have done some speculating about heavy meteorite impacts. You are interested in things. You have a good smattering of scientific knowledge. This must be you, or you wouldn't be reading this magazine.

There is a brisk breeze in your face and you are enjoying the fresh air. As you look up into the sky you see a strange light phenomenon. It is high in the sky, rapidly growing larger. Due to the angle of approach and perspective, it seems to be slowly sinking toward the horizon. Almost at the same instant you may notice a slight hissing of the grass, bushes and trees around you. Maybe you have stood near where a bolt of lightning was to strike and you recognize these premonitory signs. Only this time the experience lasts longer and builds in intensity. In the time it takes for you to count ten seconds it sounds more like you are standing in a symphony of gasoline chain saws.

These are electromagnetic effects which can be expected when six-and-a-half square kilometers of plasma piled up in front of a meteorite approaches an area at twenty kilometers per second. St. Elmo's fire would extend a foot from all the sharp prominences in the neighborhood, including, perhaps, your head. I mean, of course, your ears, nose, and hair.

Surprise, incredulity, and fear would stop your breath. In the meantime, you have watched this small light with the brightness of the Sun get larger and larger. By the time it reaches the horizon the core has the size and shape of the Sun, only hotter. The core is surrounded by a halo which extends a hundred kilometers all around it. Before it sinks below the horizon, you are in this halo and the noise is deafening. You don't know it yet, but you have received a lethal dose of X rays.

As the bolide sinks below the horizon the static electrical phenomenon stops. Great beams of light like the aurora borealis shoot across the sky above your head. Seconds later there is a great flash on the horizon. Ozone fills the air. A great ball of white and yellow light taking up a third of the horizon just becomes visible when the ground is zipped from under you and a bush that was fifteen feet in front of you rushes over and smacks the wind out of you. You see houses yaw and fracture. Green leaves are whipped from the trees. Water spouts from the streets and lawns like geysers. You just have time to get up on one knee and note the rising red-orange mushroom cloud when the ground is zipped from under you the other way. All the pebbles and everything that is loose on the ground just hop up and come down again maintaining the same relationship to you but falling on the ground ten feet or so from where they started.

Buildings that have yawed one way now yaw the other and are coming to the ground in a cloud of dust. The experience has been painful. Every bone in your body feels broken. There is a green and purple spot in your vision. You still have doubts. You are not sure it isn't an atomic bomb, but the significance of the red-orange color of the cloud is percolating through to you.

By the time you get to your feet the first billow of the mushroom cloud has formed and a second one is forming. Orange flames are leaping up through its thick brown throat. Blue-white flashes of lightning are leaping around its periphery. You judge it to be forty-five kilometers in diameter.

A sudden motion of the distant trees catches your eye—shock wave! "Lie down behind a wall," you quote from the survival manual. There's no wall around! The nearest thing you can see is a curb, and that's running the wrong way. You dive into the shallow water of the gutter, hug the mud and snuggle your body to the curb. You nut! You have your head toward the oncoming trouble! It should be your feet! That's instinct for you! No time for change! Cover your head with both hands!

You're just barely conscious of a smarting of the skin of your face, hands and wrists. The gravel in the gutter seems to cut into your skin. The shock wave hits! First it sounds like a million people knocking the slats out

# Secondary Meteorites

BY RALPH H. HALL, M.D.

of shutters with baseball bats. Then it feels as if a steam roller falls on your back. The dust stings your skin and gets into your eyes and mouth almost choking you. A terrific thunder fills the day. Your eardrums ache like they have been boxed. You put both hands over your ears. Your hair is whipped and pulled at the roots. Concussion after concussion rolls over you. The hot wind lashes and tugs at you. The whole world is blowing up! It looks like a roof sailing by. A car rolls over-and-over up the street sounding like an oversized garbage can. You hardly see the sunlight. Then suddenly it stops. You hear a woman cry in agony. You turn your head sharply in the direction from which it comes. Now the wind is building up the other way. It is a steady blow in a mounting whistling crescendo. Your coat blows over your head. Your pants flap against your legs. Singing sand again. Not quite so bad this time.

Eventually things quiet considerably. Now you stand up and spit out the dirt. Wipe your face gingerly. If you crane your neck, you can see the red-orange cloud passing over head. A red-orange fog is coming across the country. Rocks and debris are falling here and there, some the size of a house. You can't see the pillar of fire any more. Suddenly it begins to rain.

It is raining tiny black pellets, hot black pellets. Instinctively you put out your hand. Some pellets gather in your palm. They burn a little, but you can hold them. Now the black pellets are joined by a few bright shiny silvery ones, about a tenth of a millimeter in diameter. You can just see them through the fading bright spot in your vision. Now there are many bright hot pellets falling and you are certain about what has happened.

A man with a red face runs up the street. "Bomb!" he screams.

"No, meteor!" you shout in his face "—Meteorite!" you correct yourself. (Muffed your one line!) "That was a million times as big as any atom bomb you ever saw!" you cover. The poor guy has never seen an atom bomb in his life! First a dumfounded expression comes to his face, all the dumber because his eyebrows are singed-up into little knots. Then he double-takes and studies you as if he has just seen you for the first time. He's trying to size you up. Are you any use to him? Or should he run away from you. The red-orange fog closes in. The hot rust smell of a foundry assails the nostrils. You have one more thing to say before you both jog off, crunching the tiny spheres on the pavement, picking your way around fallen trees and rubble: "I'll bet that threw up a lot of secondaries!" There's no doubt about it: you are in charge here!

Hope that "hot line" to Russia will be working or this may not be the worst. First you may tell your story; then, you may die.

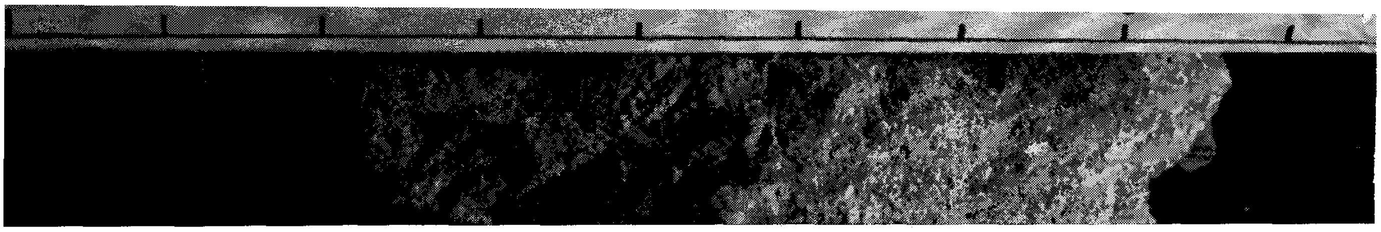
The ways of the universe are awful. Man is poorly equipped to be a witness. If given a chance, one would be safer to run away and hide. If you are a spectator to a big show, the price of admission is very likely to be your life. Explorers and adventurers know this. Prepare yourself as best you can, but your best may not be enough. There is always a price. Don't depend on cheating at the last minute.

This dramatized description of the fall of a great meteorite is based on hundreds of eye-witness reports of small falls observed from a greater distance. Each of the effects has been observed on a smaller scale. They simply have been magnified by an appropriate factor for this description. Many of the ideas for this come from a reconstruction of evidence at the sites of meteoric falls, such as Barringer Crater in New Mexico, and at the Vredfort ring in South Africa. There are nearly fifty such sites known in the world. Dr. Robert Dietz adds a new one practically every year.

### *Introduction*

In a previous article: "Interstellar Passenger Capsule," June 1962, we discussed the possibility that the Orgueil meteorite might have originated from our own planet and is a harbinger of evidence that our own Earth born deoxyribonucleic acid could have fostered Earth-like metabolism and heredity factors on other favorable planets throughout the Milky-way galaxy. This suggestion, if it were so, would encourage us to expect wholesome conditions wherever interstellar human passengers might step out of their capsules to explore. There we might find food fit for our consumption with matching metabolic factors of carbohydrates, hydrocarbons and proteins. Or indeed, there we might find predators that would feature us on their menu advantageously.

Previously, we had suggested that such fossil bearing meteorites as Orgueil and Ivuna were secondary meteorites which were blown into orbit around the Sun by an exploding large primary meteorite. Further study of the other types of meteorites from this new point of view has brought forth corroborative evidence of the earlier proposition as well as shedding light on the morphology of mesosiderites,



PICTURE: COURTESY OF DR. ROBERT S. DIETZ

*Shatter-cones have been known for a longer time, but their significance was only recently explained by Robert S. Dietz. They are now considered almost pathognomonic of a meteorite impact area. This block of shatter-cones was found in the limestone at the bull's-eye of the Wells Creek Meteorite Crater in Tennessee. The terrific shock wave of the heavy meteorite impact creates these patterns in the solid rock. Most of us have manufactured similar patterns by shooting BB's at the bottom of a glass bottle, or with worse luck seen them knocked out of plate glass windows.*

chondrites, and achondrites, the three important classes of stony meteorites.

The internal construction of the stony meteorites is a mystery that begs for explanation. This mystery is inextricably mixed with their origin. Two theories of origin have dominated the field of meteorics. One, that the meteorites have originated from the break up of a planet in the region of the asteroid belt. Two, that the meteorites have accreted in space from the cold building materials of the universe. The fact that this latter theory handily parallels the general theory of the origin of the universe must be bypassed. The recent finding of hydrocarbons of biological construction in the Orgueil and Ivuna meteorites links the carbonaceous meteorites with living material. Further study of these biological hydrocarbons in meteorites is promoted almost daily by the work of Dr. Warren Meinschein. Much interest has been shown in so-called organized elements in the type I carbonaceous meteorites. Claus and Nagy have interpreted them as various species of fossil creatures, whereas Fitch and Anders—June 1963—have given another interpretation to them. The hexagonal formed elements have proved in some cases to be minerals. Other types of "fossils" either were not found at all by the second team or were found to correspond closely to pollen contaminants. When pollen particles will reach as high as three hundred particles per cc of air, they are difficult to eliminate from microscopic studies.

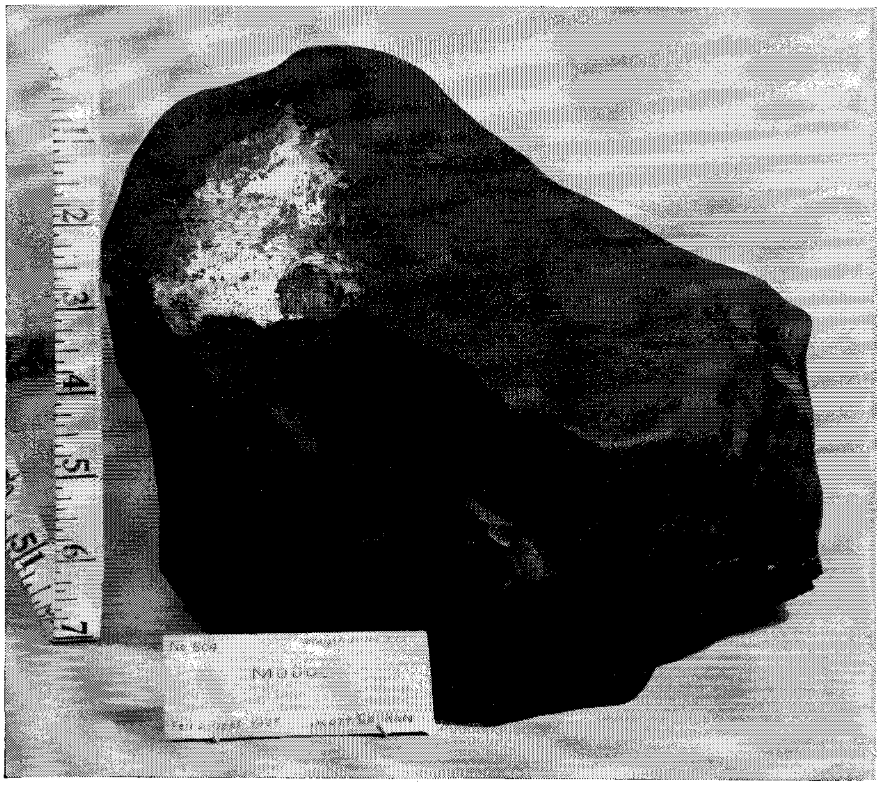
This discovery of the hydrocarbons has given us incentive to re-examine the theories of meteoric origins and find them wanting. If hydrocarbons came from the primary planet or planets of the asteroid belt, we would have to revise our current concepts of solar system temperatures and perhaps postulate a time when the asteroid region was warmer. This would upset a well devised time table for the life of our Sun. If we could envision another practical origin for these stones within the present timetable of solar events, this would be helpful.

Mariner II has recently reaffirmed the radio telescope findings that the surface temperatures of the planet Venus is 444° C. Stones like Orgueil and Ivuna change their characteristics at 400° C. That leaves but two possible sources in this solar system from which these carbonaceous stones could originate, namely: Mars and Earth.

A search has been made for a natural force of sufficient quality and quantity to place a stone into orbit. Some thought has been given to volcanoes. Tectonic forces that have lifted mountain ranges thirty thousand feet into the air certainly have quantity enough. The problem is to find a natural force with enough intensity and under the right conditions to orbit fractions of the planets and satellites. An atomic bomb has intensity enough. Some thought has been given to natural accumulations of plutonium sufficient to cause a chain reaction and an

*Modoc fell in Scott County Kansas, Sept. 2, 9:30 P. M., 1905. It is a hypersthene chondrite weighing 2045 grams. This stone clearly illustrates the "thumb prints" due to the burning action of the air as it fell. The outer shell was scorched and fused, while the inner volume remained deep-freeze cold, something like a baked Alaska. The fractured portion reveals the thinness of the crust. There is an unusually large chondrule in the lower right part of the light area. Another feature of these stone meteorites is that nearly all are mildly magnetic.*

COURTESY OF THE AMERICAN MUSEUM OF NATURAL HISTORY.

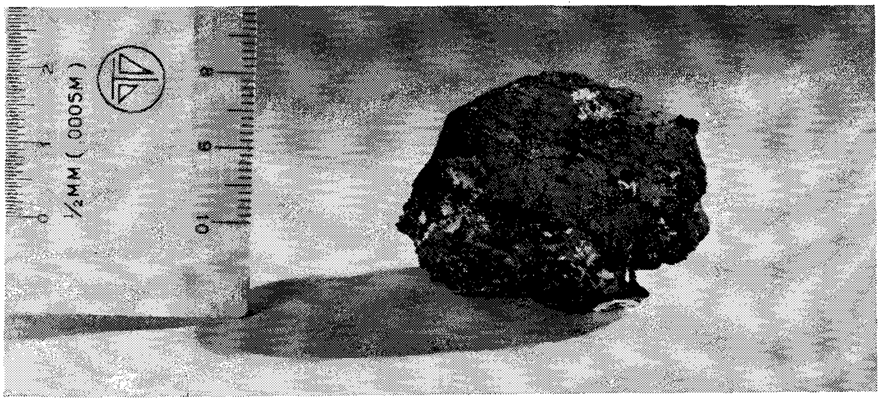


# SECONDARY METEORITES

atomic explosion, but the suggestion of such an improbability wilts in the face of a long unpromoted force: Heavy meteoric impacts. Not only does this impact have energy and intensity enough to place a stone into orbit, but a more careful look at the impact phase gives a plausible answer to the mystery of the constitutional makeup of stony meteorites.

In the explanation of their makeup we will use an unfamiliar type of material interaction, which has only recently been touched on by the work of Milton and De Carli. In their experiment they sent a shock wave through wafers of rock at $4\frac{1}{2}$ km/sec. As a result they observed solid-to-solid cold material interaction which was both physical and chemical. In this phenomenon the energy of combination was not due to a thermic chemical reaction but was due instead to the kinetic energy of two colliding bodies in the form of a shock wave. This shook the combining elements into a new molecular structure—a sort of a dynamic interaction.

Study of the morphology of meteorites with this concept in mind leads to fantastic dreams. Such meteorites as Veramin suggest the science-fiction possibility of cold solid-*through*-solid occurrences. This becomes probable as we consider the dynamics of collisions at twenty kilometers per second or more. This study opens the window on what might be a new method for unusual effects in the manufacture of special products.



*Orgueil, Mountaubon, France, seen to fall at 8:00 P. M. May 14, 1864 after the appearance of a luminous meteor and detonations probably due to sonic booms. About 20 stones, the largest the size of a man's head but most as large as a fist, fell over the area of two square miles. This stone is so friable that it is easily crushed between the fingers. Hardly a type of stone that would contain enough pressure to explode on release. It has at various times been purported to have live bacteria, fossils, and organic material. The bacteria have been doubted, the fossils are currently in limbo, but every day Dr. Warren G. Meinschein strengthens the case for biological hydrocarbons. This hotly discussed stone is the fulcrum upon which turn the theories of meteoric origin.*

In the fourth dimension one can walk through a wall. Maybe one could do the same thing in three dimensions if one walked fast enough! The study of meteorites takes us closer to these concepts, for they are the result of high speed impacts that were just too slow to make it through and through.

### *Definitions*

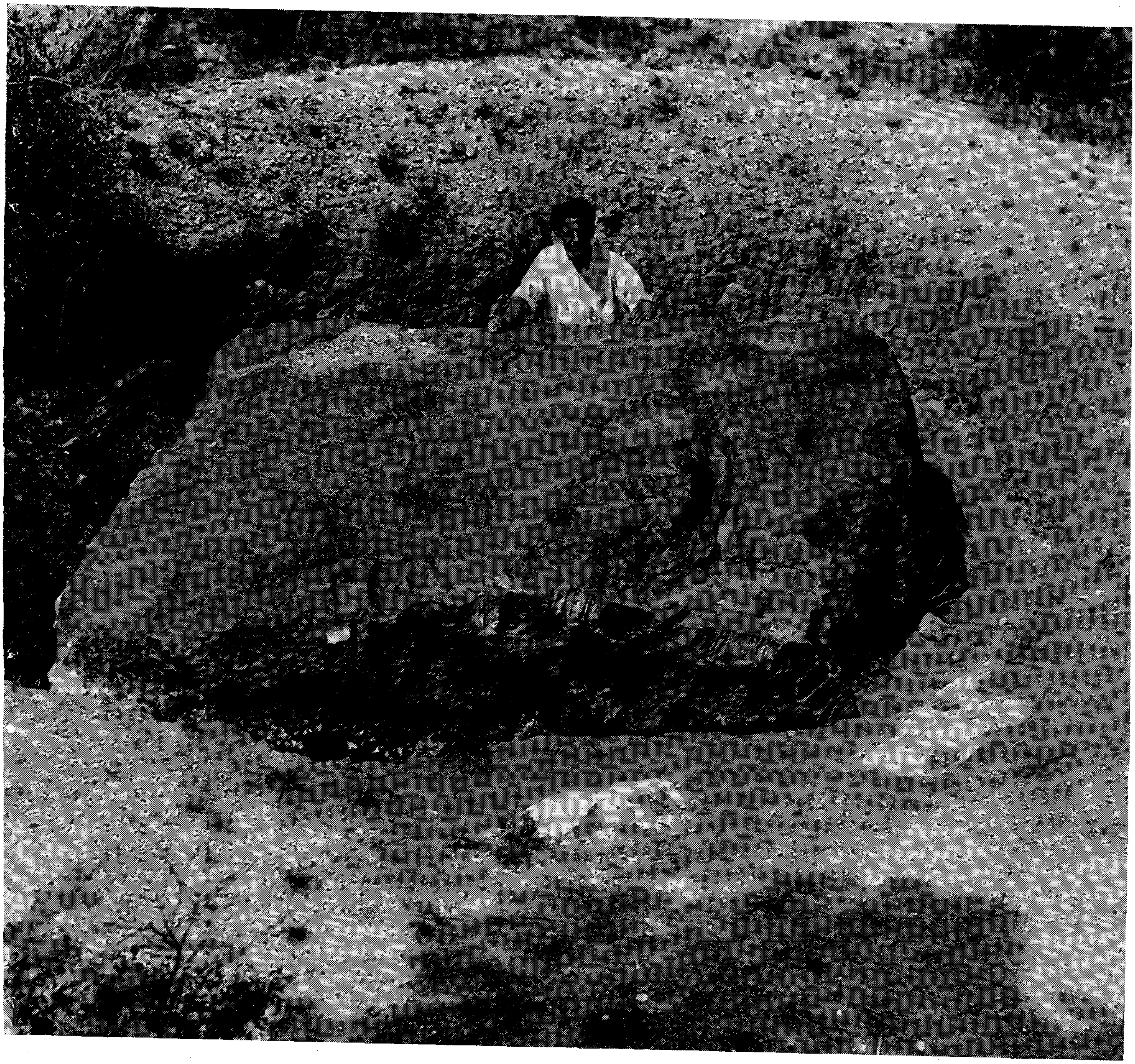
We had best pause here for some definitions. First, three words: meteoroid, meteor and metorite. A meteoroid is any solid body in space that may become either a meteor or a meteorite. It may be an asteroid fragment, a cometary particle, a fragment from outside the solar system, or, as is being emphasized in this article, a fragment of a planet or satellite.

A meteor is a *shooting star*. Meteors are much too small to survive passage through the atmosphere and are completely consumed as they enter the air blanket. These small ones appear in showers, and have been identified conclusively with cometary activity. That is to say, they are particles left behind as comets ply their way through the interplanetary space. When the Earth runs into their trail, meteors are seen to streak through the atmosphere.

Meteorites, on the other hand, are more adventitious. They are seen to fall singly and are unassociated with cometary phenomena. A meteorite is a solid body that has fallen to a planet or satellite by dint of surviving the passage through the atmosphere, if any.

Whenever a meteorite is found, it is given the name of the locality or nearest town; to wit: Orgueil is in France; Ivuna is in Tanganyika Africa.

For purposes of discussion in this paper I wish to classify meteorites as primary and secondary in origin. Meteorites of primary origin would



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*Hoba fell in South West Africa and was found in 1920. It is a nickel-rich ataxite: nickel amounting to 18%. Its weight is estimated from measurements to be 60 metric tons. Much of the meteorite is weathered away and permeates the limestone bed on which it lies. It probably weighed over 100 tons when it fell. This is the largest known intact meteorite. Meteorites of this size are slowed considerably by the air resistance. A meteorite of about twice this size would strike with all the physical attributes of a soft mud pie, for example: Henbury in Australia. Meteorites of a thousand tons and up are imperceptibly slowed by the atmosphere.*

# SECONDARY METEORITES

*For the convenience of the reader, a short table of meteoric minerals is included here:*

- Nickel-iron (Ni,Fe)
- *Schreibersite $(Ni,Fe)_3P$
- Troilite FeS
- Silicates
    - Pigeonite $(Mg,Fe)SiO_3$ & $CaMg(SiO_3)_2$
    - Olivine $(Mg,Fe)SiO_4$
    - Orthopyroxine $(Mg,Fe)SiO_3$
        - Enstatite, less than 10 mole % of $FeSiO_3$
        - Bronzite 10 - 20% " " " "
        - Hypersthene, Greater than 20 Mole % $FeSiO_3$
    - Serpentine $Mg_6Si_4O_{10}(OH)_8$

Kamacite, the alpha iron of metallurgists is a nickel-iron alloy with 5.5% Nickel.

Taenite, the gamma iron of Metallurgists, is an alloy of variable composition ranging from 27 - 65% nickel.

come from the break up of the primary asteroid planet or planets, and would include such meteorites as the siderites and some of the siderolites.

*Background*

Meteorites are of varying physical composition which can be grouped into three classes which have both a scientific and a common name. Some have been seen as they fell. Others have been found without their fall being observed. These relationships can be correlated by the following table. The numbers indicate the numbers of specimens, followed by the percentages. See Table I.

TABLE I, CLASSIFICATION OF METEORITES AS TO OCCURRENCE

| | FALLS | % | FINDS | % | TOTALS | % |
|---|---|---|---|---|---|---|
| Siderites or Irons | 42 | 6 | 503 | 58.5 | 545 | 35 |
| Siderolites or Stony Irons | 12 | 2 | 55 | 6.5 | 67 | 4 |
| Aerolites or Stones | 628 | 92 | 304 | 35.0 | 932 | 61 |
| | 682 | 100 | 862 | 100.0 | 1544 | 100 |

Please note that many more stones than irons were seen to fall. Of the seen falls, the stones and stony-irons constitute ninety-four per cent of the total. This ratio throws a severe strain on the theory which postulates the common primary origin of the stone and iron meteorites, for we generally conceive of a planet as being about one-one-thousandth silicate in ratio to the iron. Therefore, if the meteorites come entirely from the break up of an "Asteroid Planet," the ratio should be the other way around; i.e. 999 irons to one silicate.

We could start a discussion of individual meteoric falls such as Hoba in South Africa, Henbury in Australia, in which the argument would be filled with lengthy descriptions of each type of meteoric fall. We could trace the phenomena of bigger and bigger meteorite strikes from an instance near Helsinki where the meteorite hardly penetrated the ice, through the simple impact pits, the plastic phases, to the explosion phases. All this has been done many times. It would be better in this case to discuss an integrated concept such as Ralph Baldwin's discussion of the Barringer Crater in Arizona. You see, anything under one thousand tons will be slowed markedly by the atmosphere. Effects of such small meteorite falls are not pertinent to this article. Fortunately, we have an impact site of a meteorite variously estimated to weigh sixty thousand to two hundred fifty thousand tons which is in a very good state of preservation, though it fell some twenty-five thousand years ago.

Through a study of almost fifty known areas of large meteorite impact, we have come to understand that the penetration of the surface by the meteorite is relatively shallow. Where the speeds are such that the forces involved in a sudden stop are so great as to far exceed the ultimate strengths of all materials involved, we see that the meteorite and impact area act like two colliding white-hot high-pressure plasmas. For that is the condition at the point of impact.

Here we depart somewhat from Ralph Baldwin's concepts, and far from taking part in the expert's haggle over the detailed facts, we will simply chose our own preferred set of factors and go on from there. We will choose the *maximum* of suggested impact speed of twenty kilometers per second and therefore its accompanying suggested minimum weight of sixty thousand tons. The approach must be from slightly west of North and at some angle between 45° with the ground to *nearly* perpendicular. Whatever the elevation of the approach angle, the explosion crater will be as round as the geophysical structures will permit. Oblique impacts can yield circular craters if the flow velocities generated by the explosion release exceed any component velocity parallel to the impact surface, which the material may have acquired as a consequence of oblique impact.

*continued on page 81*

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*The asterick indicates one mineral that has never been identified as a natural Earth mineral. There are others: Osbornite, TiN; Oldhamite, CaS; Daubreelite, $FeCr_2S_4$; Lawrencite, $FeCl_2$; Merrillite, $Na_2Ca_3(PO_4)\ O(?)$; Farringtonite, $Mg_3(PO_4)_2$.*

# THE EYES HAVE IT

In a sense,
this is a story
of here-and-now.
This Earth, this year . . .
but on a history-line
slipped slightly sidewise.
A history in which a great man acted
differently, and Magic,
rather than physical science,
was developed . . .

**RANDALL GARRETT**

Illustrated by John Schoenherr

Sir Pierre Morlaix, Chevalier of the Angevin Empire, Knight of the Golden Leopard, and secretary-in-private to my lord, the Count D'Evreux, pushed back the lace at his cuff for a glance at his wrist watch—three minutes of seven. The Angelus had rung at six, as always, and my lord D'Evreux had been awakened by it, as always. At least, Sir Pierre could not remember any time in the past seventeen years when my lord had not awakened at the Angelus. Once, he recalled, the sacristan had failed to ring the bell, and the Count had been furious for a week. Only the intercession of Father Bright, backed by the Bishop himself, had saved the sacristan from doing a turn in the dungeons of Castle D'Evreux.

Sir Pierre stepped out into the corridor, walked along the carpeted flagstones, and cast a practiced eye around him as he walked. These old castles were difficult to keep clean, and my lord the Count was fussy about nitre collecting in the seams between the stones of the walls. All appeared quite in order, which was a good thing. My lord the Count had been making a night of it last evening, and that always made him the more peevish in the morning. Though he always woke at the Angelus, he did not always wake up sober.

Sir Pierre stopped before a heavy, polished, carved oak door, selected a key from one of the many at his belt, and turned it in the lock. Then he went into the elevator and the door locked automatically behind him. He pressed the switch and waited in patient silence as he was lifted up four floors to the Count's personal suite.

By now, my lord the Count would have bathed, shaved, and dressed. He would also have poured down an eye-opener consisting of half a water glass of fine Champagne brandy. He would not eat breakfast until eight. The Count had no valet in the strict sense of the term. Sir Reginald Beauvay held that title, but he was never called upon to exercise the more personal functions of his office. The Count did not like to be seen until he was thoroughly presentable.

The elevator stopped. Sir Pierre stepped out into the corridor and walked along it toward the door at the far end. At exactly seven o'clock, he rapped briskly on the great door which bore the gilt-and-polychrome arms of the House D'Evreux.

For the first time in seventeen years, there was no answer.

Sir Pierre waited for the growled command to enter for a full minute, unable to believe his ears. Then, almost timidly, he rapped again.

There was still no answer.

Then, bracing himself for the verbal onslaught that would follow if he had erred, Sir Pierre turned the handle and opened the door just as if he had heard the Count's voice telling him to come in.

"Good morning, my lord," he said, as he always had for seventeen years.

But the room was empty, and there was no answer.

He looked around the huge room. The morning sunlight streamed in through the high mullioned windows and spread a diamond-checkered pattern across the tapestry on the far wall, lighting up the brilliant hunting scene in a blaze of color.

"My lord?"

Nothing. Not a sound.

The bedroom door was open. Sir Pierre walked across to it and looked in.

He saw immediately why my lord the Count had not answered, and that, indeed, he would never answer again.

My lord the Count lay flat on his back, his arms spread wide his eyes staring at the ceiling. He was still clad in his gold and scarlet evening clothes. But the great stain on the front of his coat was not the same shade of scarlet as the rest of the cloth, and the stain had a bullet hole in its center.

Sir Pierre looked at him without moving for a long moment. Then he stepped over, knelt, and touched one of the Count's hands with the back of his own. It was quite cool. He had been dead for hours.

"I knew someone would do you in sooner or later, my lord," said Sir Pierre, almost regretfully.

The he rose from his kneeling position and walked out without another look at his dead lord. He locked the door of the suite, pocketed the key, and went back downstairs in the elevator.

Mary, Lady Duncan stared out of the window at the morning sunlight and wondered what to do. The Angelus bell had awakened her from a fitful sleep in her chair, and she knew that, as a guest at Castle D'Evreux, she would be expected to appear at Mass again this morning. But how could she? How could she face the Sacramental Lord on the altar—to say nothing of taking the Blessed Sacrament Itself.

Still, it would look all the more conspicuous if she did not show up this morning after having made it a point to attend every morning with Lady Alice during the first four days of this visit.

She turned and glanced at the locked and barred door of the bedroom. *He* would not be expected to come. Laird Duncan used his wheelchair as an excuse, but since he had taken up black magic as a hobby he had, she suspected, been actually afraid to go anywhere near a church.

If only she hadn't lied to him! But how could she have told the truth? That would have been worse—infinitely worse. And now, because of that lie, he was locked in his bedroom doing only God and the Devil knew what.

If only he would come out. If he would only stop whatever it was he had been doing for all these long hours—or at least finish it! Then they could leave Evreux, make some excuse—any excuse—to get away. One of them could feign sickness. Anything, anything to get them out of France, across the Channel, and back to Scotland, where they would be safe!

She looked back out of the window, across the courtyard, at the towering stone walls of the Great Keep and at the high window that opened into the suite of Edouard, Count D'Evreux.

Last night she had hated him, but no longer. Now there was only room in her heart for fear.

She buried her face in her hands and cursed herself for a fool. There were no tears left for weeping—not after the long night.

Behind her, she heard the sudden noise of the door being unlocked, and she turned.

Laird Duncan of Duncan opened the door and wheeled himself out. He was followed by a malodorous gust of vapor from the room he had just left. Lady Duncan stared at him.

He looked older than he had last night, more haggard and worn, and there was something in his eyes she did not like. For a moment he said nothing. Then he wet his lips with the tip of his tongue. When he spoke, his voice sounded dazed.

"There is nothing to fear any more," he said. "Nothing to fear at all."

The Reverend Father James Valois Bright, Vicar of the Chapel of Saint-Esprit, had as his flock the several hundred inhabitants of the Castle D'Evreux. As such, he was the ranking priest—socially, not hierarchically—in the country. Not counting the Bishop and the Chapter at the Cathedral, of course. But such knowledge did little good for the Father's peace of mind. The turnout of his flock was abominably small for its size—especially for week-day Masses. The Sunday Masses were well attended, of course; Count D'Evreux was there punctually at nine every Sunday, and he had a habit of counting the house. But he never showed up on weekdays, and his laxity had allowed a certain further laxity to filter down through the ranks.

The great consolation was Lady Alice D'Evreux. She was a plain, simple girl, nearly twenty years younger than her brother, the Count, and quite his opposite in every way. She was quiet where he was thundering, self-effacing where he was flamboyant, temperate where he was drunken, and chaste where he was—

Father Bright brought his thoughts to a full halt for a moment. He had, he reminded himself, no right to make judgments of that sort. He was not, after all, the Count's confessor; the Bishop was.

Besides, he should have his mind on his prayers just now.

He paused and was rather surprised to notice that he had already put on his alb, amice, and girdle, and he was aware that his lips had formed the words of the prayer as he had donned each of them.

*Habit,* he thought, *can be destructive to the contemplative faculty.*

He glanced around the sacristy. His server, the young son of the Count of Saint Brieuc, sent here to complete his education as a gentleman who would some day be the King's Governor of one of the most important counties in Brittany, was pulling his surplice down over his head. The clock said 7:11.

Father Bright forced his mind Heavenward and repeated silently the vesting prayers that his lips had formed meaninglessly, this time putting his full intentions behind them. Then he added a short mental prayer asking God to forgive him for allowing his thoughts to stray in such a manner.

He opened his eyes and reached for his chasuble just as the sacristy door opened and Sir Pierre, the Count's Privy Secretary, stepped in.

"I must speak to you, Father," he said in a low voice. And, glancing at the young De Saint-Brieuc, he added: "Alone."

Normally, Father Bright would have reprimanded anyone who presumed to break into the sacristy as he was vesting for Mass, but he knew that Sir Pierre would never interrupt without good reason. He nodded and went outside in the corridor that led to the altar.

"What is it, Pierre?" he asked.

"My lord the Count is dead. Murdered."

After the first momentary shock, Father Bright realized that the news was not, after all, totally unexpected. Somewhere in the back of his mind, it seemed he had always known that the Count would die by violence long before debauchery ruined his health.

"Tell me about it," he said quietly.

Sir Pierre reported exactly what he had done and what he had seen.

"Then I locked the door and came straight here," he told the priest.

"Who else has the key to the Count's suite?" Father Bright asked.

"No one but my lord himself," Sir Pierre answered, "at least as far as I know."

"Where is his key?"

"Still in the ring at his belt. I noticed that particularly."

"Very good. We'll leave it locked. You're certain the body was cold?"

"Cold and waxy, Father."

"Then he's been dead many hours."

"Lady Alice will have to be told," Sir Pierre said.

Father Bright nodded. "Yes. The Countess D'Evreux must be informed of her succession to the County Seat." He could tell by the sudden momentary blank look that came over Sir Pierre's face that the Privy Secretary had not yet realized fully the implications of the Count's death. "I'll tell her, Pierre. She should be in her pew by now. Just step into the church and tell her quietly that I want to speak to her. Don't tell her anything else."

"I understand, Father," said Sir Pierre.

There were only twenty-five or thirty people in the pews—most of them women—but Alice, Countess D'Evreux was not one of them. Sir Pierre walked quietly and unobtrusively down the side aisle and out into the narthex. She was standing there, just inside the main door, adjusting the black lace mantilla about her head, as though she had just come in from outside. Suddenly, Sir Pierre was very glad he would not have to be the one to break the news.

She looked rather sad, as always, her plain face unsmiling. The jutting nose and square chin which had given her brother the Count a look of aggressive handsomeness only made her look very solemn and rather sexless, although she had a magnificent figure.

"My lady," Sir Pierre said, stepping towards her, "the Reverend Father would like to speak to you before Mass. He's waiting at the sacristy door."

She held her rosary clutched tightly to her breast and gasped. Then she said, "Oh. Sir Pierre. I'm sorry; you quite surprised me. I didn't see you."

"My apologies, my lady."

"It's all right. My thoughts were elsewhere. Will you take me to the good Father?"

Father Bright heard their footsteps coming down the corridor before he saw them. He was a little fidgety because Mass was already a minute overdue. It should have started promptly at 7:15.

The new Countess D'Evreux took the news calmly, as he had known she would. After a pause, she crossed herself and said: "May his soul rest in peace. I will leave everything in your hands, Father, Sir Pierre. What are we to do?"

"Pierre must get on the teleson to Rouen immediately and report the matter to His Highness. I will announce your brother's death and ask for prayers for his soul—but I think I need say nothing about the manner of his death. There is no need to arouse any more speculation and fuss than necessary."

"Very well," said the Countess. "Come, Sir Pierre; I will speak to the Duke, my cousin, myself."

"Yes, my lady."

Father Bright returned to the sacristy, opened the missal, and changed the placement of the ribbons. Today was an ordinary Feria; a Votive Mass would not be forbidden by the rubics. The clock said 7:17. He turned to young De Saint-Brieuc, who was waiting respectfully. "Quickly, my son—go and get the unbleached beeswax candles and put them on the altar. Be sure you light them before you put out the white ones. Hurry, now; I will be ready by the time you come back. Oh, yes—and change the altar frontal. Put on the black."

"Yes, Father." And the lad was gone.

Father Bright folded the green chasuble and returned it to the drawer, then took out the black one. He would say a Requiem for the Souls of All the Faithful Departed—and hope that the Count was among them.

His Royal Highness, the Duke of Normandy, looked over the official letter his secretary had just typed for him. It was addressed to *Serenissimus Dominus Nostrus Iohannes Quartus, Dei Gratia, Angliae, Franciae, Scotiae, Hiberniae, et Novae Angliae, Rex, Imperator, Fidei Defensor,* . . . "Our Most Serene Lord, John IV, by the Grace of God King and Emperor of England, France, Scotland, Ireland, and New England, Defender of the Faith, . . ."

It was a routine matter; simple notification to his brother, the King, that His Majesty's most faithful servant, Edouard, Count of Evreux, had departed this life, and asking His Majesty's confirmation of the Count's heir-at-law, Alice, Countess of Evreux as his lawful successor.

His Highness finished reading, nodded, and scrawled his signature at the bottom: *Richard Dux Normaniae.*

Then, on a separate piece of paper, he wrote: "Dear John, May I suggest you hold up on this for a while? Edouard was a lecher and a slob, and I have no doubt he got everything he deserved, but we have no notion who killed him. For any evidence I have to the contrary, it might have been Alice who pulled the trigger. I will send you full particulars as soon as I have them. With much love, Your brother and servant, Richard."

He put both papers into a prepared envelope and sealed it. He wished he could have called the King on the teleson, but no one had yet figured out how to get the wires across the channel.

He looked absently at the sealed envelope, his handsome blond features thoughtful. The House of Plantagenet had endured for eight centuries, and the blood of Henry of Anjou ran thin in its veins, but the Norman strain was as strong as ever, having been replenished over the centuries by fresh infusions from Norwegian and Danish princesses. Richard's mother, Queen Helga, wife to His late Majesty, Henry X, spoke very few words of Anglo-French, and those with a heavy Norse accent.

Nevertheless, there was nothing Scandinavian in the language, manner, or bearing of Richard, Duke of Normandy. Not only was he a member of the oldest and most powerful ruling family of Europe, but he bore a Christian name that was distinguished even in that family. Seven Kings of the Empire had borne the name, and most of them had been good Kings—if not always "good" men in the nicey-nicey sense of the word. Even old Richard I, who'd been pretty wild during the first forty-odd years of his life, had settled down to do a magnificent job of kinging for the next twenty years. The long and painful recovery from the wound he'd received at the Siege of Chaluz had made a change in him for the better.

There was a chance that Duke Richard might be called

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upon to uphold the honor of that name as King. By law, Parliament must elect a Plantagenet as King in the event of the death of the present Sovereign, and while the election of one of the King's two sons, the Prince of Wales and the Duke of Lancaster, was more likely than the election of Richard, he was certainly not eliminated from the succession.

Meantime, he would uphold the honor of his name as Duke of Normandy.

Murder had been done; therefore justice must be done. The Count D'Evreux had been known for his stern but fair justice almost as well as he had been known for his profligacy. And, just as his pleasures had been without temperance, so his justice had been untempered by mercy. Whoever had killed him would find both justice and mercy—in so far as Richard had it within his power to give it.

Although he did not formulate it in so many words, even mentally, Richard was of the opinion that some debauched woman or cuckolded man had fired the fatal shot. Thus he found himself inclining toward mercy before he knew anything substantial about the case at all.

Richard dropped the letter he was holding into the special mail pouch that would be placed aboard the evening trans-Channel packet, and then turned in his chair to look at the lean, middle-aged man working at a desk across the room.

"My lord Marquis," he said thoughtfully.

"Yes, Your Highness?" said the Marquis of Rouen, looking up.

"How true are the stories one has heard about the late Count?"

"True, Your Highness?" the Marquis said thoughtfully. "I would hesitate to make any estimate of percentages. Once a man gets a reputation like that, the number of his reputed sins quickly surpasses the number of actual ones. Doubtless many of the stories one hears are of whole cloth; others may have only a slight basis in fact. On the other hand, it is highly likely that there are many of which we have never heard. It is absolutely certain, however, that he has acknowledged seven illegitimate sons, and I dare say he has ignored a few daughters—and these, mind you, with unmarried women. His adulteries would be rather more difficult to establish, but I think your Highness can take it for granted that such escapades were far from uncommon."

He cleared his throat and then added, "If Your Highness is looking for motive, I fear there is a superabundance of persons with motive."

"I see," the Duke said. "Well, we will wait and see what sort of information Lord Darcy comes up with." He looked up at the clock. "They should be there by now."

Then, as if brushing further thoughts on that subject from his mind, he went back to work, picking up a new sheaf of state papers from his desk.

The Marquis watched him for a moment and smiled a little to himself. The young Duke took his work seriously, but well-balanced about it. A little inclined to be romantic—but aren't we all at nineteen? There was no doubt of his ability, nor of his nobility. The Royal Blood of England always came through.

"My lady," said Sir Pierre gently, "the Duke's Investigators have arrived."

My Lady Alice, Countess D'Evreux, was seated in a gold-brocade upholstered chair in the small receiving room off the Great Hall. Standing near her, looking very grave, was Father Bright. Against the blaze of color on the walls of the room, the two of them stood out like ink blots. Father Bright wore his normal clerical black, unrelieved except for the pure white lace at collar and cuffs. The Countess wore unadorned black velvet, a dress which she had had to have altered hurriedly by her dressmaker; she had always hated black and owned only the mourning she had worn when her mother died eight years before. The somber looks on their faces seemed to make the black blacker.

"Show them in, Sir Pierre," the Countess said calmly.

Sir Pierre opened the door wider, and three men entered. One was dressed as one gently born; the other two wore the livery of the Duke of Normandy.

The gentleman bowed. "I am Lord Darcy, Chief Criminal Investigator for His Highness, the Duke, and your servant, my lady." He was a tall, brown-haired man in his thirties with a rather handsome, lean face. He spoke Anglo-French with a definite English accent.

"My pleasure, Lord Darcy," said the Countess. "This is our vicar, Father Bright."

"Your servant, Reverend Sir." Then he presented the two men with him. The first was a scholarly-looking, graying man wearing pince-nez glasses with gold rims, Dr. Pateley, Physician. The second, a tubby, red-faced, smiling man, was Master Sean O Lochlainn, Sorcerer.

As soon as Master Sean was presented he removed a small, leather-bound folder from his belt pouch and proffered it to the priest. "My license, Reverend Father."

Father Bright took it and glanced over it. It was the usual thing, signed and sealed by the Archbishop of Rouen. The law was rather strict on that point; no sorcerer could practice without the permission of the Church, and a license was given only after careful examination for orthodoxy of practice.

"It seems to be quite in order, Master Sean," said the priest, handing the folder back. The tubby little sorcerer bowed his thanks and returned the folder to his belt pouch.

Lord Darcy had a notebook in his hand. "Now, unpleasant as it may be, we shall have to check on a few facts." He consulted his notes, then looked up at Sir Pierre. "You, I believe, discovered the body?"

"That is correct, your lordship."

"How long ago was this?"

Sir Pierre glanced at his wrist watch. It was 9:55. "Not quite three hours ago, your lordship."

"At what time, precisely?"

"I rapped on the door precisely at seven, and went in a minute or two later—say 7:01 or 7:02."

"How do you know the time so exactly?"

"My lord the Count," said Sir Pierre with some stiffness, "insisted upon exact punctuality. I have formed the habit of referring to my watch regularly."

"I see. Very good. Now, what did you do then?"

Sir Pierre described his actions briefly.

"The door to his suite was not locked, then?" Lord Darcy asked.

"No, sir."

"You did not expect it to be locked?"

"No, sir. It has not been for seventeen years."

Lord Darcy raised one eyebrow in a polite query. "Never?"

"Not at seven o'clock, your lordship. My lord the Count always rose promptly at six and unlocked the door before seven."

"He did lock it at night, then?"

"Yes, sir."

Lord Darcy looked thoughtful and made a note, but he said nothing more on that subject. "When you left, you locked the door?"

"That is correct, your lordship."

"And it has remained locked ever since?"

Sir Pierre hesitated and glanced at Father Bright. The priest said: "At 8:15, Sir Pierre and I went in. I wished to view the body. We touched nothing. We left at 8:20."

Master Sean O Lochlainn looked agitated. "Er . . . excuse me, Reverend Sir. You didn't give him Holy Unction, I hope?"

"No," said Father Bright. "I thought it would be better to delay that until after the authorities had seen the . . . er . . . scene of the crime. I wouldn't want to make the gathering of evidence any more difficult than necessary."

"Quite right," murmured Lord Darcy.

"No blessings, I trust, Reverend Sir?" Master Sean persisted. "No exorcisms or—"

"Nothing," Father Bright interrupted somewhat testily. "I believe I crossed myself when I saw the body, but nothing more."

"Crossed *yourself*, sir. Nothing else?"

"No."

"Well, that's all right, then. Sorry to be so persistent, Reverend Sir, but any miasma of evil that may be left around is a very important clue, and it shouldn't be dispersed until it's been checked, you see."

*"Evil?"* My lady the Countess looked shocked.

"Sorry, my lady, but—" Master Sean began contritely.

But Father Bright interrupted by speaking to the Countess. "Don't distress yourself, my daughter; these men are only doing their duty."

"Of course. I understand. It's just that it's so—" She shuddered delicately.

Lord Darcy cast Master Sean a warning look, then asked politely, "Has my lady seen the deceased?"

"No," she said. "I will, however, if you wish."

"We'll see," said Lord Darcy. "Perhaps it won't be necessary. May be go up to the suite now?"

"Certainly," the Countess said. "Sir Pierre, if you will?"

"Yes, my lady."

As Sir Pierre unlocked the emblazoned door, Lord Darcy said: "Who else sleeps on this floor?"

"No one else, your lordship," Sir Pierre said. "The entire floor is . . . *was* . . . reserved for my lord the Count."

"Is there any way up besides that elevator?"

Sir Pierre turned and pointed toward the other end of the short hallway. "That leads to the staircase," he said, pointing to a massive oaken door, "but it's kept locked at all times. And, as you can see, there is a heavy bar across it. Except for moving furniture in and out or something like that, it's never used."

"No other way up or down, then?"

Sir Pierre hesitated. "Well, yes, your lordship, there is. I'll show you."

"A secret stairway?"

"Yes, your lordship."

"Very well. We'll look at it after we've seen the body."

Lord Darcy, having spent an hour on the train down from Rouen, was anxious to see the cause of all the trouble at last.

He lay in the bedroom, just as Sir Pierre and Father Bright had left him.

"If you please, Dr. Pateley," said his lordship.

He knelt on one side of the corpse and watched carefully while Pateley knelt on the other side and looked at the face of the dead man. Then he touched one of the hands and tried to move an arm. "Rigor has set in—even to the fingers. Single bullet hole. Rather small caliber—I should say a .28 or .34—hard to tell until I've probed out the bullet. Looks like it went right through the heart, though. Hard to tell about powder burns; the blood has soaked the clothing and dried. Still, these specks . . . hm-m-m. Yes. Hm-m-m."

Lord Darcy's eyes took in everything, but there was little enough to see on the body itself. Then his eye was caught by something that gave off a golden gleam. He stood up and walked over to the great canopied four-poster bed, then he was on his knees again, peering under it. A coin? No.

He picked it up carefully and looked at it. A button. Gold, intricately engraved in an Arabesque pattern, and set in the center with a single diamond. How long had it lain there? Where had it come from? Not from the Count's clothing, for his buttons were smaller, engraved with his arms, and had no gems. Had a man or a woman dropped it? There was no way of knowing at this stage of the game.

Darcy turned to Sir Pierre. "When was this room last cleaned?"

"Last evening, your lordship," the secretary said promptly. "My lord was always particular about that. The suite was always to be swept and cleaned during the dinner hour."

"Then this must have rolled under the bed at some time after dinner. Do you recognize it? The design is distinctive."

The Privy Secretary looked carefully at the button in the palm of Lord Darcy's hand without touching it. "I . . . I hesitate to say," he said at last. "It looks like . . . but I'm not sure—"

"Come, come, Chevalier! Where do you think you *might* have seen it? Or one like it." There was a sharpness in the tone of his voice.

"I'm not trying to conceal anything, your lordship," Sir Pierre said with equal sharpness. "I said I was not sure. I still am not, but it can be checked easily enough. If your lordship will permit me—" He turned and spoke to Dr. Pateley, who was still kneeling by the body. "May I have my lord the Count's keys, doctor?"

Pateley glanced up at Lord Darcy, who nodded silently. The physician detached the keys from the belt and handed them to Sir Pierre.

The Privy Secretary looked at them for a moment, then selected a small gold key. "This is it," he said, separating it from the others on the ring. "Come with me, your lordship."

Darcy followed him across the room to a broad wall covered with a great tapestry that must have dated back to the sixteenth century. Sir Pierre reached behind it and pulled a cord. The entire tapestry slid aside like a panel, and Lord Darcy saw that it was supported on a track some ten feet from the floor. Behind it was what looked at first like ordinary oak paneling, but Sir Pierre fitted the small key into an inconspicuous hole and turned. Or, rather, tried to turn.

"That's odd," said Sir Pierre. "It's not locked!"

He took the key out and pressed on the panel, shoving sideways with his hand to move it aside. It slid open to reveal a closet.

The closet was filled with women's clothing of all kinds, and styles.

Lord Darcy whistled soundlessly.

"Try that blue robe, your lordship," the Privy Secretary said. "The one with the—Yes, that's the one."

Lord Darcy took it off its hanger. The same buttons. They matched. And there was one missing from the front! Torn off! "Master Sean!" he called without turning.

Master Sean came with a rolling walk. He was holding an oddly-shaped bronze thing in his hand that Sir Pierre didn't quite recognize. The sorcerer was muttering. "Evil, that there is! Faith, and the vibrations are all over the place. Yes, my lord?"

"Check this dress and the button when you get round to it. I want to know when the two parted company."

"Yes, my lord." He draped the robe over one arm and dropped the button into a pouch at his belt. "I can tell you one thing, my lord. You talk about an evil miasma, this room has got it!" He held up the object in his hand. "There's an underlying background—something that has been here for years, just seeping in. But on top of that, there's a hellish big blast of it superimposed. Fresh it is, and very strong."

"I shouldn't be surprised, considering there was murder done here last night—or very early this morning," said Lord Darcy.

"Hm-m-m, yes. Yes, my lord, the death is there—but there's something else. Something I can't place."

"You can tell that just by holding that bronze cross in your hand?" Sir Pierre asked interestedly.

Master Sean gave him a friendly scowl. " 'Tisn't quite a cross, sir. This is what is known as a *crux ansata*. The ancient Egyptians called it an *ankh*. Notice the loop at the top instead of the straight piece your true cross has. Now, your true cross—if it were properly energized, blessed, d'ye see—your true cross would tend to dissipate the evil. The *ankh* merely vibrates to evil because of the closed loop at the top, which makes a return circuit. And it's not energized by blessing, but by another . . . um . . . spell."

"Master Sean, we have a murder to investigate," said Lord Darcy.

The sorcerer caught the tone of his voice and nodded quickly. "Yes, my lord." And he walked rollingly away.

"Now where's that secret stairway you mentioned, Sir Pierre?" Lord Darcy asked.

"This way, your lordship."

He led Lord Darcy to a wall at right angles to the outer wall and slid back another tapestry.

"Good Heavens," Darcy muttered, "does he have something concealed behind every arras in the place?" But he didn't say it loud enough for the Privy Secretary to hear.

This time, what greeted them was a solid-seeming stone wall. But Sir Pierre pressed in on one small stone, and a section of the wall swung back, exposing a stairway.

"Oh, yes," Darcy said. "I see what he did. This is the old spiral stairway that goes round the inside of the Keep. There are two doorways at the bottom. One opens into the courtyard, the other is a postern gate through the curtain wall to the outside—but that was closed up in the sixteen century, so the only way out is into the courtyard."

"Your lordship knows Castle D'Evreux, then?" Sir Pierre said. The knight himself was nearly fifty, while Darcy was only in his thirties, and Sir Pierre had no recollection of Darcy's having been in the Castle before.

"Only by the plans in the Royal Archives. But I have made it a point to—" He stopped. "Dear me," he interrupted himself mildly, "what is that?"

"That" was something that had been hidden by the arras until Sir Pierre had slid it aside, and was still showing only a part of itself. It lay on the floor a foot or so from the secret door.

Darcy knelt down and pulled the tapestry back from the object. "Well, well. A .28 two-shot pocket gun. Gold-chased, beautifully engraved, mother-of-pearl handle. A regular gem." He picked it up and examined it closely. "One shot fired."

He stood up and showed it to Sir Pierre. "Ever see it before?"

The Privy Secretary looked at the weapon closely. Then he shook his head. "Not that I recall, your lordship. It certainly isn't one of the Count's guns."

"You're certain?"

"Quite certain, your lordship. I'll show you the gun collection if you want. My lord the Count didn't like tiny guns like that; he preferred a larger caliber. He would never have owned what he considered a toy."

"Well, we'll have to look into it." He called over Master Sean again and gave the gun into his keeping. "And keep your eyes open for anything else of interest, Master Sean. So far, everything of interest besides the late Count himself has been hiding under beds or behind arrases. Check everything. Sir Pierre and I are going for a look down this stairway."

The stairway was gloomy, but enough light came in through the arrow slits spaced at intervals along the outer wall to illuminate the interior. It spiraled down between the inner and outer walls of the Great Keep, making four complete circuits before it reached ground level. Lord Darcy looked carefully at the steps, the walls, and even the low, arched overhead as he and Sir Pierre went down.

After the first circuit, on the floor beneath the Count's suite, he stopped. "There was a door here," he said, pointing to a rectangular area in the inner wall.

"Yes, your lordship. There used to be an opening at every floor, but they were all sealed off. It's quite solid, as you can see."

"Where would they lead if they were open?"

"The county offices. My own office, the clerk's offices, the constabulary on the first floor. Below are the dungeons. My lord the Count was the only one who lived in the Keep itself. The rest of the household live above the Great Hall."

"What about guests?"

"They're usually housed in the east wing. We only have two house guests at the moment. Laird and Lady Duncan have been with us for four days."

"I see." They went down perhaps four more steps before Lord Darcy asked quietly, "Tell me, Sir Pierre, were you privy to *all* of Count D'Evreux's business?"

Another four steps down before Sir Pierre answered. "I understand what your lordship means," he said. Another two steps. "No, I was not. I was aware that my lord the Count engaged in certain . . . er . . . shall we say, liaisons with members of the opposite sex. However—"

He paused, and in the gloom, Lord Darcy could see his lips tighten. "However," he continued, "I did not procure for my lord, if that is what you're driving at. I am not and never have been a pimp."

"I didn't intend to suggest that you had, good knight," said Lord Darcy in a tone that strongly implied that the thought had actually never crossed his mind. "Not at all. But certainly there is a difference between 'aiding and abetting' and simple knowledge of what is going on."

"Oh. Yes. Yes, of course. Well, one cannot, of course, be the secretary-in-private of a gentleman such as my lord the Count for seventeen years without knowing something of what is going on, you're right. Yes. Yes. Hm-m-m."

Lord Darcy smiled to himself. Not until this moment had Sir Pierre realized how much he actually *did* know. In loyalty to his lord, he had literally kept his eyes shut for seventeen years.

"I realize," Lord Darcy said smoothly, "that a gentleman would never implicate a lady nor besmirch the reputation of another gentleman without due cause and careful consideration. However,"—like the knight, he paused a moment before going on—"although we are aware that he was not discreet, was he particular?"

"If you mean by that, did he confine his attentions to those of gentle birth, your lordship, then I can say, no he did not. If you mean did he confine his attentions to the gentler sex, then I can only say that, as far as I know, he did."

"I see. That explains the closet full of clothes."

"Beg pardon, your lordship?"

"I mean that if a girl or woman of the lower classes were to come here, he would have proper clothing for them to wear—in spite of the sumptuary laws to the contrary."

"Quite likely, your lordship. He was most particular about clothing. Couldn't stand a woman who was sloppily dressed or poorly dressed.

"In what way?"

"Well. Well, for instance, I recall once that he saw a very pretty peasant girl. She was dressed in the common style, of course, but she was dressed neatly and prettily. My lord took a fancy to her. He said, 'Now there's a lass who knows how to wear clothes. Put her in decent apparel, and she'd pass for a princess.' But a girl, who had a pretty face and a fine figure, made no impression on him unless she wore her clothing well, if you see what I mean, your lordship."

"Did you never know him to fancy a girl who dressed in an offhand manner?" Lord Darcy asked.

"Only among the gently born, your lordship. He'd say, 'Look at Lady So-and-so! Nice wench, if she'd let me teach her how to dress.' You might say, your lordship, that a woman could be dressed commonly or sloppily, but not both."

"Judging by the stuff in that closet," Lord Darcy said, "I should say that the late Count had excellent taste in feminine dress."

Sir Pierre considered. "Hm-m-m. Well, now, I wouldn't exactly say so, your lordship. He knew *how* clothes should be worn, yes. But He couldn't pick out a woman's gown of his accord. He could choose his own clothing with impeccable taste, but he'd not any real notion of how a woman's clothing should go, if you see what I mean. All he knew was how good clothing should be worn. But he knew nothing about design for women's clothing."

"Then how did he get that closet full of clothes?" Lord Darcy asked, puzzled.

Sir Pierre chuckled. "Very simply, your lordship. He knew that the Lady Alice had good taste, so he secretly instructed that each piece that Lady Alice ordered should be made in duplicate. With small variations, of course. I'm certain my lady wouldn't like it if she knew."

"I dare say not," said Lord Darcy thoughtfully.

"Here is the door to the courtyard," said Sir Pierre. "I doubt that it has been opened in broad daylight for many years." He selected a key from the ring of the late Count and inserted it into a keyhole. The door swung back, revealing a large crucifix attached to its outer surface. Lord Darcy crossed himself. "Lord in Heaven," he said softly, "what is this?"

He looked out into a small shrine. It was walled off from the courtyard and had a single small entrance some ten feet from the doorway. There were four *pre-dieu's*—small kneeling benches—ranged in front of the doorway.

"If I may explain, your lordship—" Sir Pierre began.

"No need to," Lord Darcy said in a hard voice. "It's rather obvious. My lord the Count was quite ingenious. This is a relatively newly-built shrine. Four walls and a crucifix against the castle wall. Anyone could come in here, day or night, for prayer. No one who came in would be suspected." He stepped out into the small enclosure and swung around to look at the door. "And when that door is closed, there is no sign that there is a door behind the crucifix. If a woman came in here, it would be assumed that she came for prayer. But if she knew of that door—" His voice trailed off.

"Yes, your lordship," said Sir Pierre. "I did not approve, but I was in no position to disapprove."

"I understand." Lord Darcy stepped out to the doorway of the little shrine and took a quick glance about. "Then anyone within the castle walls could come in here," he said.

"Yes, your lordship."

"Very well. Let's go back up."

In the small office which Lord Darcy and his staff had been assigned while conducting the investigation, three men watched while a fourth conducted a demonstration on a table in the center of the room.

Master Sean O Lochlainn held up an intricately engraved gold button with an Arabesque pattern and a diamond set in the center.

He looked at the other three. "Now, my lord, your Reverence, and colleague Doctor, I call your attention to this button."

Dr. Pateley smiled and Father Bright looked stern. Lord Darcy merely stuffed tobacco—imported from the southern New England counties on the Gulf—into a German-made porcelain pipe. He allowed Master Sean a certain amount of flamboyance; good sorcerers were hard to come by.

"Will you hold the robe, Dr. Pateley? Thank you. Now, stand back. That's it. Thank you. Now, I place the button on the table, a good ten feet from the robe." Then he muttered something under his breath and dusted a bit of powder on the button. He made a few passes over it with his hands, paused, and looked up at Father Bright. "If you will, Reverend Sir?"

Father Bright solemnly raised his right hand, and, as he made the Sign of the Cross, said: "May this demonstration, O God, be in strict accord with the truth, and may the Evil One not in any way deceive us who are witnesses thereto. In the Name of the Father and of the Son and of the Holy Spirit. Amen."

"Amen," the other three chorused.

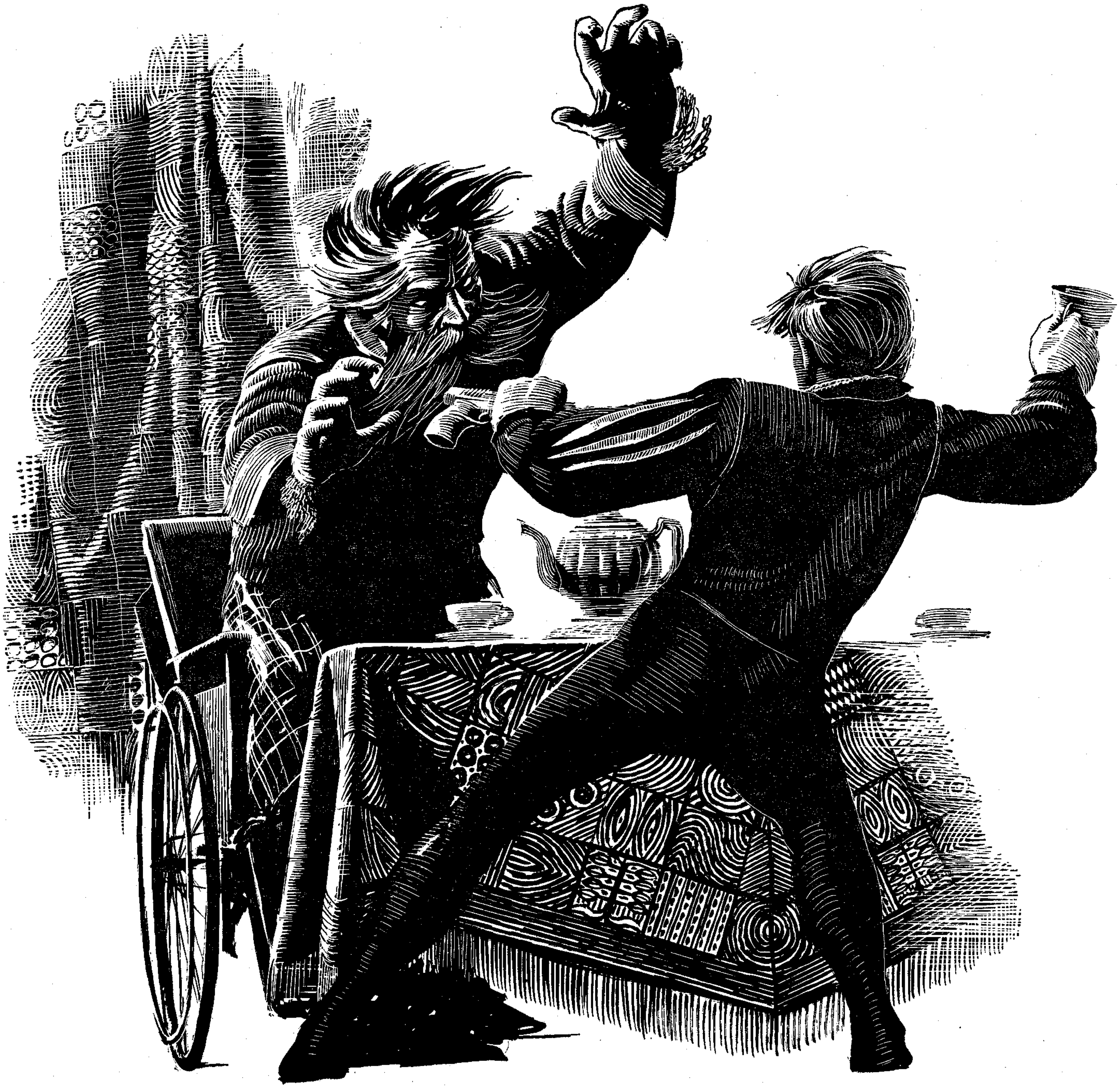
Master Sean crossed himself, then muttered something under his breath.

The button leaped from the table, slammed itself against the robe which Dr. Pateley held before him, and stuck there as though it had been sewed on by an expert.

"Ha!" said Master Sean. "As I thought!" He gave the other three men a broad, beaming smile. "The two were definitely connected!"

Lord Darcy looked bored. "Time?" he asked.

"In a moment, my lord," Master Sean said apoligetically. "In a moment." While the other three watched, the sorcerer went through more spells with the button and the robe, although none were so spectacular as the first demonstration. Finally, Master Sean said: "About eleven thirty last night they were torn apart, my lord. But I shouldn't like to make it any more definite than to say



beween eleven and midnight. The speed with which it returned to its place shows that it was ripped off very rapidly, however."

"Very good," said Lord Darcy. "Now the bullet, if you please."

"Yes, my lord. This will have to be a bit different." He took more paraphernalia out of his large, symbol-decorated carpet bag. "The Law of Contagion, gently-born sirs, is a tricky thing to work with. If a man doesn't know how to handle it, he can get himself killed. We had an apprentice o' the guild back in Cork who might have made a good sorcerer in time. He had the talent—unfortunately, he didn't have the good sense to go with it. According to the Law of Contagion any two objects which have ever been in contact with each other have an affinity for each other which is directly proportional to the product of the degree of relevancy of the contact and the length of time they were in contact and inversely proportional to the length of time since they have ceased to be in contact." He gave a smiling glance to the priest. "That doesn't apply strictly to relics of the saints, Reverend Sir; there's another factor enters in there, as you know."

As he spoke, the sorcerer was carefully clamping the little handgun into a padded vise so that its barrel was parallel to the surface of the table.

"Anyhow," he went on, "this apprentice, all on his own, decided to get rid of the cockroaches in his house—a simple thing, if one knows how to go about it. So he collected dust from various cracks and crannies about the house, dust which contained, of course, the droppings of the pests. The dust, with the appropriate spells and ingredients, he boiled. It worked fine. The roaches all came down with a raging fever and died. Unfortunately, the clumsy lad had poor laboratory technique. He allowed three drops of his own perspiration to fall into the steaming pot over which he was working, and the resulting fever killed him, too."

By this time, he had put the bullet which Dr. Pateley had removed from the Count's body on a small pedestal so that it was exactly in line with the muzzle of the gun. "There, now," he said softly.

Then he repeated the incantation and the powdering that he had used on the button. As the last syllable was formed by his lips, the bullet vanished with a *ping!* In its vise, the little gun vibrated.

"Ah!" said Master Sean. "No question there, eh? That's the death weapon, all right, my lord. Yes. Time's almost exactly the same as that of the removal of the button. Not more than a few seconds later. Forms a picture, don't it, my lord? His lordship the Count jerks a a button off the girl's gown, she outs with a gun and plugs him."

Lord Darcy's handsome face scowled. "Let's not jump to any hasty conclusions, my good Sean. There is no evidence whatever that he was killed by a woman."

"Would a man be wearing that gown, my lord?"

"Possibly," said Lord Darcy. "But who says that anyone was wearing it when the button was removed?"

"Oh." Master Sean subsided into silence. Using a small ramrod, he forced the bullet out of the chamber of the little pistol.

"Father Bright," said Lord Darcy, "will the Countess be serving tea this afternoon?"

The priest looked suddenly contrite. "Good heavens! None of you has eaten yet! I'll see that something is sent up right away, Lord Darcy. In the confusion—"

Lord Darcy held up a hand. "I beg your pardon, Father; that wasn't what I meant. I'm sure Master Sean and Dr. Pateley would appreciate a little something, but I can wait until tea time. What I was thinking was that perhaps the Countess would ask her guests to tea. Does she know Laird and Lady Duncan well enough to ask for their sympathetic presence on such an afternoon as this?"

Father Bright's eyes narrowed a trifle. "I dare say it could be arranged, Lord Darcy. You will be there?"

"Yes—but I may be a trifle late. That will hardly matter at an informal tea."

The priest glanced at his watch. "Four o'clock?"

"I should think that would do it," said Lord Darcy.

Father Bright nodded wordlessly and left the room.

Dr. Pateley took off his pince-nez and polished the lenses carefully with a silk handkerchief. "How long will your spell keep the body incorrupt, Master Sean?" he asked.

"As long as it's relevant. As soon as the case is solved, or we have enough data to solve the case—as the case may be, heh heh—he'll start to go. I'm not a saint, you know; it takes powerful motivation to keep a body incorrupt for years and years."

Sir Pierre was eying the gown that Pateley had put on the table. The button was still in place, as if held there by magnetism. He didn't touch it. "Master Sean, I don't know much about magic," he said, "but can't you find out who was wearing this robe just as easily as you found out that the button matched?"

Master Sean wagged his head in a firm negative. "No, sir. 'Tisn't relevant, sir. The relevancy of the integrated dress-as-a-whole is quite strong. So is that of the seamstress or tailor who made the garment, and that of the weaver who made the cloth. But, except in certain circumstances, the person who wears or wore the garment has little actual relevancy to the garment itself."

"I'm afraid I don't understand," said Sir Pierre, looking puzzled.

"Look at it like this, sir: That gown wouldn't be what it is if the weaver hadn't made the cloth in that particular way. It wouldn't be what it is if the seamstress hadn't cut it in a particular way and sewed it in a specific manner. You follow, sir? Yes. Well, then, the connections between garment-and-weaver and garment-and-seamstress are strongly relevant. But this dress would still be pretty much what it is if it had stayed in the closet instead of being worn. No relevance—or very little. Now, if it were a well-worn garment, that would be different—that is, if it had always been worn by the same person. Then, you see, sir, the garment-as-a-whole is what it is because of the wearing, and the wearer becomes relevant."

He pointed at the little handgun he was still holding in his hand. "Now you take your gun, here, sir. The—"

"It isn't *my* gun," Sir Pierre interrupted firmly.

"I was speaking rhetorically, sir," said Master Sean with infinite patience. "This gun or any other gun in general, if you see what I mean, sir. It's even harder to place the ownership of a gun. Most of the wear on a gun is purely mechanical. It don't matter *who* pulls the trigger, you see, the erosion by the gases produced in the chamber, and the wear caused by the bullet passing through the barrel will be the same. You see, sir, 'tisn't relevant *to the gun* who pulled its trigger or what it's fired at. The bullet's a slightly different matter. To the bullet, it *is* relevant which gun it was fired from and what it hit. All these things simply have to be taken into account, Sir Pierre."

"I see," said the knight. "Very interesting, Master Sean." Then he turned to Lord Darcy. "Is there anything else, your lordship? There's a great deal of county business to be attended to."

Lord Darcy waved a hand. "Not at the moment, Sir Pierre. I understand the pressures of government. Go right ahead."

"Thank you, your lordship. If anything further should be required, I shall be in my office."

As soon as Sir Pierre had closed the door, Lord Darcy held out his hand toward the sorcerer. "Master Sean; the gun."

Master Sean handed it to him. "Ever see one like it before?" he asked, turning it over in his hands.

"Not *exactly* like it, my lord."

"Come, *come*, Sean; don't be so cautious. I am no sorcerer, but I don't need to know the Laws of Similarity to be able to recognize an *obvious* similarity."

"Edinburgh," said Master Sean flatly.

"Exactly. Scottish work. The typical Scot gold work; remarkable beauty. And look at that lock. It has 'Scots' written all over it—and more, 'Edinburgh', as you said."

Dr. Pateley, having replaced his carefully polished glasses, leaned over and peered at the weapon in Lord Darcy's hand. "Couldn't it be Italian, my lord? Or Moorish? In Moorish Spain, they do work like that."

"No Moorish gunsmith would put a hunting scene on the butt," Lord Darcy said flatly, "and the Italians wouldn't have put heather and thistles in the field surrounding the huntsman."

"But the *FdM* engraved on the barrel," said Dr. Pateley, "indicates the—"

"Ferrari of Milan," said Lord Darcy. "Exactly. But the barrel is of much newer work than the rest. So are the chambers. This is a fairly old gun—fifty years old, I'd say. The lock and the butt are still in excellent condition, indicating that it has been well cared for, but frequent usage—or a single accident—could ruin the barrel and require the owner to get a replacement. It was replaced by Ferrari."

"I see," said Dr. Pateley, somewhat humbled.

"If we open the lock . . . Master Sean, hand me your small screwdriver. Thank you. If we open the lock, we will find the name of one of the finest gunsmiths of half a century ago—a man whose name has not yet been forgotten—Hamish Graw of Edinburgh. Ah! There! You see?" They did.

Having satisfied himself on that point, Lord Darcy closed the lock again. "Now, men, we have the gun located. We also know that a guest in this very castle is Laird Duncan of Duncan. The Duncan of Duncan himself. A Scot's laird who was, fifteen years ago, His Majesty's Minister Plenipotentiary to the Free Grand Duchy of Milan. That suggests to me that it would be indeed odd if there were not some connection between Laird Duncan and this gun. Eh?"

"Come, *come*, Master Sean," said Lord Darcy rather impatiently, "We haven't all the time in the world."

"Patience, my lord; patience," said the little sorcerer calmly. "Can't hurry these things, you know." He was kneeling in front of a large, heavy traveling chest in the bedroom of the guest apartment occupied temporarily by Laird and Lady Duncan, working with the lock. "One position of a lock is just as relevant as the other so you can't work with the bolt. But the pin-tumblers in the cylinder, now, that's a different matter. A lock's built so that the breaks in the tumblers are not related to the surface of the cylinder when the key is out, but there *is* a relation when the key's *in*, so by taking advantage of that relevancy—Ah!"

The lock clicked open.

Lord Darcy raised the lid gently.

"Carefully, my lord!" Master Sean said in a warning voice. "He's got a spell on the thing! Let me do it." He made Lord Darcy stand back and then lifted the lid of the heavy trunk himself. When it was leaning back against the wall, gaping open widely on its hinges, Master Sean took a long look at the trunk and its lid without touching either of them. There was a second lid on the trunk, a thin one obviously operated by a simple bolt.

Master Sean took his sorcerer's staff, a five-foot, heavy rod made of the wood of the quicken tree or mountain ash, and touched the inner lid. Nothing happened. He touched the bolt. Nothing.

"Hm-m-m," Master Sean murmured thoughtfully. He glanced around the room, and his eyes fell on a heavy stone doorstop. "That ought to do it." He walked over, picked it up, and carried it back to the chest. Then he put it on the rim of the chest in such a position that if the lid were to fall it would be stopped by the doorstop.

Then he put his hand in as if to lift the inner lid.

The heavy outer lid swung forward and down of its own accord, moving with blurring speed, and slammed viciously against the doorstop.

Lord Darcy massaged his right wrist gently, as if he felt where the lid would have hit if he had tried to open the inner lid. "Triggered to slam if a human being sticks a hand in there, eh?"

"Or a head, my lord. Not very effectual if you know what to look for. There are better spells than that for guarding things. Now we'll see what his lordship wants to protect so badly that he practices sorcery without a license." He lifted the lid again, and then opened the inner lid. "It's safe now, my lord. *Look at this!*"

Lord Darcy had already seen. Both men looked in silence at the collection of paraphernalia on the first tray of the chest. Master Sean's busy fingers carefully opened the tissue paper packing of one after another of the objects. "A human skull," he said. "Bottles of graveyard earth. Hm-m-m—this one is labeled 'virgin's blood.' And this! A Hand of Glory!"

It was a mummified human hand, stiff and dry and brown, with the fingers partially curled, as though they were holding an invisible ball three inches or so in diameter. On each of the fingertips was a short candlestub. When the hand was placed on its back, it would act as a candelabra.

"That pretty much settles it, eh, Master Sean?" Lord Darcy said.

"Indeed, my lord. At the very least, we can get him for possession of materials. Black magic is a matter of symbolism and intent."

"Very well. I want a complete list of the contents of that chest. Be sure to replace everything as it was and relock the trunk." He tugged thoughtfully at an earlobe. "So Laird Duncan has the Talent, eh? Interesting."

"Aye. But not surprising, my lord," said Master Sean without looking up from his work. "It's in the blood. Some attribute it to the Dedannans, who passed through Scotland before they conquered Ireland three thousand years ago, but, however that may be, the Talent runs strong in the Sons of Gael. It makes me boil to see it misused."

While Master Sean talked, Lord Darcy was prowling around the room, reminding one of a lean tomcat who was certain that there was a mouse concealed somewhere.

"It'll make Laird Duncan boil if he isn't stopped," Lord Darcy murmured absently.

"Aye, my lord," said Master Sean. "The mental state necessary to use the Talent for black sorcery is such that it invariably destroys the user—but, if he knows what he's doing, a lot of other people are hurt before he finally gets his."

Lord Darcy opened the jewel box on the dresser. The usual traveling jewelry—enough, but not a great choice.

"A man's mind turns in on itself when he's taken up with hatred and thoughts of revenge," Master Sean droned on. "Or, if he's the type who *enjoys* watching others suffer, or the type who doesn't care but is willing to do anything for gain, then his mind is already warped and the misuse of the Talent just makes it worse."

Lord Darcy found what he was looking for in a drawer, just underneath some neatly folded lingerie. A small holster, beautifully made of Florentine leather, gilded and tooled. He didn't need Master Sean's sorcery to tell him that the little pistol fit it like a hand in a glove.

Father Bright felt as though he had been walking a tightrope for hours. Laird and Lady Duncan had been talking in low, controlled voices that betrayed an inner nervousness, but Father Bright realized that he and the Countess had been doing the same thing. The Duncan of Duncan had offered his condolences on the death of the late Count with the proper air of suppressed sorrow, as had Mary, Lady Duncan. The Countess has accepted them solemnly and with gratitude. But Father Bright was well aware that no one in the room—possibly, he thought, no one in the world—regretted the Count's passing.

Laird Duncan sat in his wheelchair, his sharp Scots features set in a sad smile that showed an intent to be affable even though great sorrow weighed heavily upon him. Father Bright noticed it and realized that his own face had the same sort of expression. No one was fooling anyone else, of that the priest was certain—but for anyone to admit it would be the most boorish breach of etiquette. But there was a haggardness, a look of increased age about the Laird's countenance that Father Bright did not like. His priestly intuition told him clearly that there was a turmoil of emotion in the Scotsman's mind that was . . . well, *evil* was the only word for it.

Lady Duncan was, for the most part, silent. In the past fifteen minutes, since she and her husband had come to the informal tea, she had spoken scarcely a dozen words. Her face was masklike, but there was the same look of haggardness about her eyes as there was in her husband's face. But the priest's emphatic sense told him that the emotion here was fear, simple and direct. His keen eyes had noticed that she wore a shade too much make-up. She had almost succeeded in covering up the faint bruise on her right cheek, but not completely.

My lady the Countess D'Evreux was all sadness and unhappiness, but there was neither fear nor evil there. She smiled politely and talked quietly. Father Bright would have been willing to bet that not one of the four of them would remember a word that had been spoken.

Father Bright had placed his chair so that he could keep an eye on the open doorway and the long hall that led in from the Great Keep. He hoped Lord Darcy would hurry. Neither of the guests had been told that the Duke's Investigator was here, and Father Bright was just a little apprehensive about the meeting. The Duncans had not even been told that the Count's death had been murder, but he was certain that they knew.

Father Bright saw Lord Darcy come in through the door at the far end of the hall. He murmured a polite excuse and rose. The other three accepted his excuses with the same politeness and went on with their talk. Father Bright met Lord Darcy in the hall.

"Did you find what you were looking for, Lord Darcy?" the priest asked in a low tone.

"Yes," Lord Darcy said. "I'm afraid we shall have to arrest Laird Duncan."

"Murder?"

"Perhaps. I'm not yet certain of that. But the charge will be black magic. He has all the paraphernalia in a chest in his room. Master Sean reports that a ritual was enacted in the bedroom last night. Of course, that's out of my jurisdiction. You, as a representative of the Church, will have to be the arresting officer." He paused. "You don't seem surprised, Reverence."

"I'm not," Father Bright admitted. "I felt it. You and Master Sean will have to make out a sworn disposition before I can act."

"I understand. Can you do me a favor?"

"If I can."

"Get my lady the Countess out of the room on some pretext or other. Leave me alone with her guests. I do not wish to upset my lady any more than absolutely necessary."

"I think I can do that. Shall we go in together?"

"Why not? But don't mention why I am here. Let them assume I am just another guest."

"Very well."

All three occupants of the room glanced up as Father Bright came in with Lord Darcy. The introductions were made; Lord Darcy humbly begged the pardon of his hostess for his lateness. Father Bright noticed the same sad smile on Lord Darcy's handsome face as the others were wearing.

Lord Darcy helped himself from the buffet table and allowed the Countess to pour him a large cup of hot tea. He mentioned nothing about the recent death. Instead, he turned the conversation toward the wild beauty of Scotland and the excellence of the grouse shooting there.

Father Bright had not sat down again. Instead, he left the room once more. When he returned, he went directly to the Countess and said, in a low, but clearly audible voice: "My lady, Sir Pierre Morlaix has informed me that there are a few matters that require your attention immediately. It will require only a few moments."

My lady the Countess did not hesitate, but made her excuses immediately. "Do finish your tea," she added. "I don't think I shall be long."

Lord Darcy knew the priest would not lie, and he wondered what sort of arrangement had been made with Sir Pierre. Not that it mattered except that Lord Darcy had hoped it would be sufficiently involved for it to keep the Countess busy for at least ten minutes.

The conversation, interrupted but momentarily, returned to grouse.

"I haven't done any shooting since my accident," said Laird Duncan, "but I used to enjoy it immensely. I still have friends up every year for the season."

"What sort of weapon do you prefer for grouse?" Lord Darcy asked.

"A one-inch bore with a modified choke," said the Scot. "I have a pair that I favor. Excellent weapons."

"Of Scottish make?"

"No, no. English. Your London gunsmiths can't be beat for shotguns."

"Oh. I thought perhaps your lordship had had all your guns made in Scotland." As he spoke, he took the little pistol out of his coat pocket and put it carefully on the table.

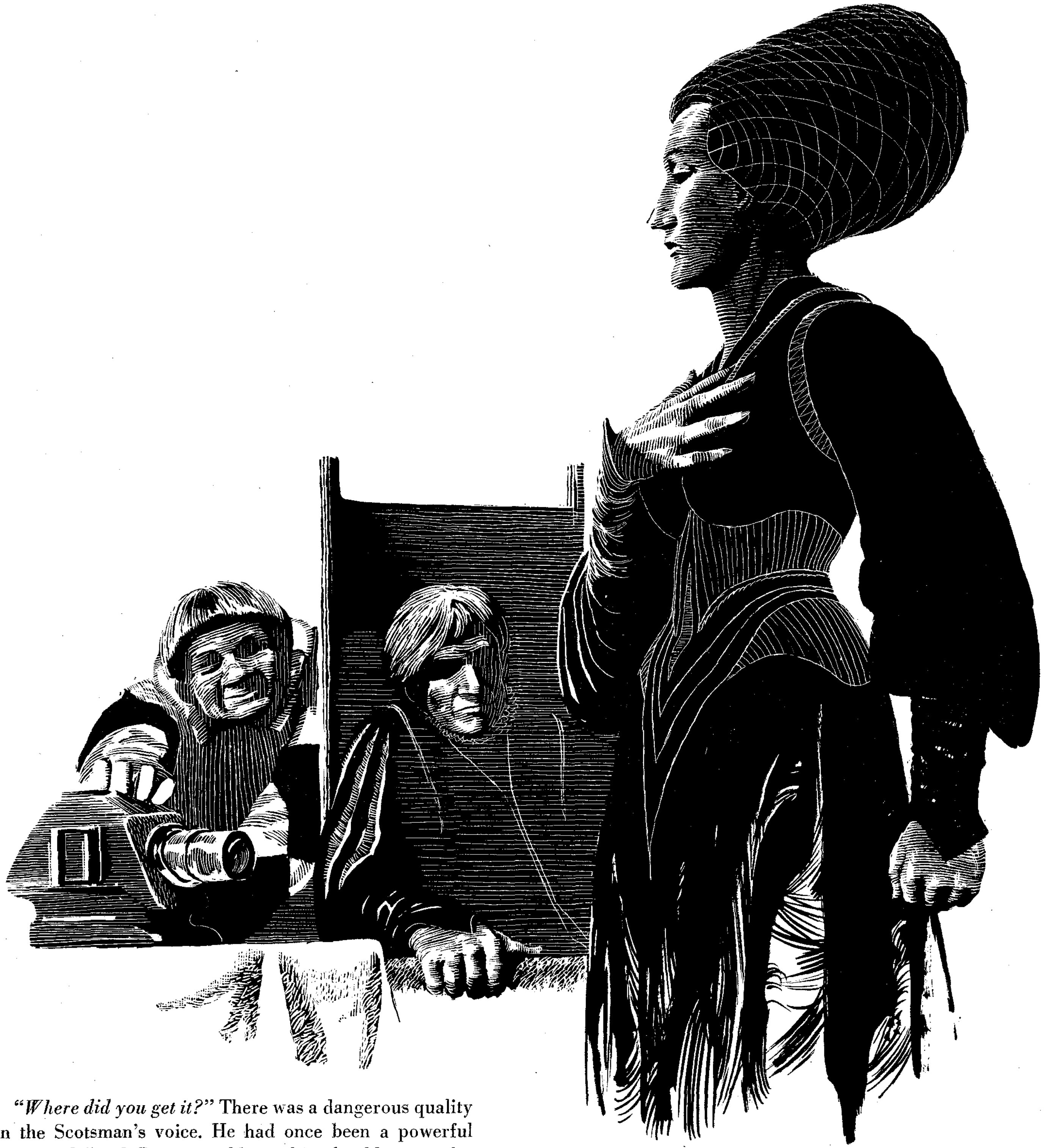
There was a sudden silence, then Laird Duncan said in an angry voice: "What is this? Where did you get that?"

Lord Darcy glanced at Lady Duncan, who had turned suddenly pale. "Perhaps," he said coolly, "Lady Duncan can tell us."

She shook her head and gasped. For a moment, she had trouble in forming words or finding her voice. Finally: "No. No. I know nothing. Nothing."

But Laird Duncan looked at her oddly.

"You do not deny that it is your gun, my lord?" Lord Darcy asked. "Or your wife's, as the case may be."



"*Where did you get it?*" There was a dangerous quality in the Scotsman's voice. He had once been a powerful man, and Lord Darcy could see his shoulder muscles bunching.

"From the late Count D'Evreux's bedroom."

"What was it doing there?" There was a snarl in the Scot's voice, but Lord Darcy had the feeling that the question was as much directed toward Lady Duncan as it was to himself.

"One of the things it was doing there was shooting Count D'Evreux through the heart."

Lady Duncan slumped forward in a dead faint, overturning her teacup. Laird Duncan made a grab at the gun, ignoring his wife. Lord Darcy's hand snaked out and picked up the weapon before the Scot could touch it. "No, no, my lord," he said mildly. "This is evidence in a murder case. We mustn't tamper with the King's evidence."

He wasn't prepared for what happened next. Laird Duncan roared something obscene in Scots Gaelic, put his hands on the arms of his wheelchair, and, with a great thrust of his powerful arms and shoulders, shoved himself up and forward, toward Lord Darcy, across the table from him. His arms swung up toward Lord Darcy's throat as the momentum of his body carried him toward the investigator.

He might have made it, but the weakness of his legs betrayed him. His waist struck the edge of the massive oaken table, and most of his forward momentum was lost. He collapsed forward, his hands still grasping toward the surprised Englishman. His chin came down hard on the table top. Then he slid back, taking the tablecloth and the china and silverware with him. He lay unmoving on the floor. His wife did not even stir except when the tablecloth tugged at her head.

Lord Darcy had jumped back, overturning his chair. He stood on his feet, looking at the two unconscious forms.

"I don't think there's any permanent damage done to either," said Dr. Pateley an hour later. "Lady Duncan was suffering from shock, of course, but Father Bright brought her round in a hurry. She's a devout woman, I think, even if a sinful one."

"What about Laird Duncan?" Lord Darcy asked.

"Well, that's a different matter. I'm afraid that his back injury was aggravated, and that crack on the chin didn't do him any good. I don't know whether Father Bright can help him or not. Healing takes the co-operation of the patient. I did all I could for him, but I'm just a chirurgeon, not a practitioner of the Healing Art. Father Bright has quite a good reputation in that line, however, and he may be able to do his lordship some good."

Master Sean shook his head dolefully. "His Reverence has the Talent, there's no doubt of that, but now he's pitted against another man who has it—a man whose mind is bent on self-destruction in the long run."

"Well, that's none of my affair," said Dr. Pateley. "I'm just a technician. I'll leave healing up to the Church, where it belongs."

"Master Sean," said Lord Darcy, "there is still a mystery here. We need more evidence. What about the eyes?"

Master Sean blinked. "You mean the picture test, my lord?"

"I do."

"It won't stand up in court, my lord," said the sorcerer.

"I'm aware of that," said Lord Darcy testily.

"Eye test?" Dr. Pateley asked blankly. "I don't believe I understand."

"It's not often used," said Master Sean. "It is a psychic phenomenon that sometimes occurs at the moment of death—especially a violent death. The violent emotional stress causes a sort of backfiring of the mind, if you see what I mean. As a result, the image in the mind of the dying person is returned to the retina. By using the proper sorcery, this image can be developed and the last thing the dead man saw can be brought out.

"But it's a difficult process even under the best of circumstances, and usually the conditions aren't right. In the first place, it doesn't always occur. It never occurs, for instance, when the person is expecting the attack. A man who is killed in a dual, or who is shot after facing the gun for several seconds, has time to adjust to the situation. Also, death must occur almost instantly. If he lingers, even for a few minutes, the effect is lost. And, naturally if the person's eyes are closed at the instant of death, nothing shows up."

"Count D'Evreux's eyes were open," Dr. Pateley said. "They were still open when we found him. How long after death does the image remain?"

"Until the cells of the retina die and lose their identity. Rarely more than twenty-four hours, usually much less."

"It hasn't been twenty-four hours yet," said Lord Darcy, "and there is a chance that the Count was taken completely by surprise."

"I must admit, my lord," Master Sean said thoughtfully, "that the conditions seem favorable. I shall attempt it. But don't put any hopes on it, my lord."

"I shan't. Just do your best, Master Sean. If there is a sorcerer in practice who can do the job, it is you."

"Thank you, my lord. I'll get busy on it right away," said the sorcerer with a subdued glow of pride.

Two hours later, Lord Darcy was striding down the corridor of the Great Hall, Master Sean following up as best he could, his *caorthainn*-wood staff in one hand and his big carpet bag in the other. He had asked Father Bright and the Countess D'Evreux to meet him in one of the smaller guest rooms. But the Countess came to meet him.

"My Lord Darcy," she said, her plain face looking worried and unhappy, "is it true that you suspect Laird and Lady Duncan of this murder? Because, if so, I must—"

"No longer, my lady," Lord Darcy cut her off quickly. "I think we can show that neither is guilty of murder—although, of course, the black magic charge must still be held against Laird Duncan."

"I understand," she said, "but—"

"Please, my lady," Lord Darcy interrupted again, "let me explain everything. Come."

Without another word, she turned and led the way to the room where Father Bright was waiting.

The priest stood waiting, his face showing tenseness.

"Please," said Lord Darcy. "Sit down, both of you. This won't take long. My lady, may Master Sean make use of that table over there?"

"Certainly, my lord," the Countess said softly, "certainly."

"Thank you, my lady. Please, please—sit down. This won't take long. Please."

With apparent reluctance, Father Bright and my lady the Countess sat down in two chairs facing Lord Darcy. They paid little attention to what Master Sean O Lochlainn was doing; their eyes were on Lord Darcy.

"Conducting an investigation of this sort is not an easy thing," he began carefully. "Most murder cases could be easily solved by your Chief Man-at-Arms. We find that well-trained county police, in by far the majority of cases, can solve the mystery easily—and in most cases there is very little mystery. But, by His Imperial Majesty's law, the Chief Man-at-Arms *must* call in a Duke's Investigator if the crime is insoluble or if it involves a member of the aristocracy. For that reason, you were perfectly correct to call His Highness the Duke as soon as murder had been discovered." He leaned back in his chair. "And it has been clear from the first that my lord the late Count was murdered."

Father Bright started to say something, but Lord Darcy cut him off before he could speak. "By 'murder', Reverend Father, I mean that he did not die a natural death—by disease or heart trouble or accident or what-have-you. I should, perhaps, use the word 'homicide'.

"Now the question we have been called upon to answer is simply this: Who was responsible for the homicide?"

The priest and the countess remained silent, looking at Lord Darcy as though he were some sort of divinely inspired oracle.

"As you know . . . pardon me, my lady, if I am blunt . . . the late Count was somewhat of a playboy. No. I will make that stronger. He was a satyr, a lecher; he was a man with a sexual obsession.

"For such a man, if he indulges in his passions—which the late Count most certainly did—there is usually but one end. Unless he is a man who has a winsome personality—which he did not—there will be someone who will hate him enough to kill him. Such a man inevitably leaves behind him a trail of wronged women and wronged men.

"One such person may kill him.

"One such person did.

"But we must find the person who did and determine the extent of his or her guilt. That is my purpose.

"Now, as to the facts. We know that Edouard had a secret stairway which led directly to his suite. Actually, the secret was poorly kept. There were many women—common and noble—who knew of the existence of that stairway and knew how to enter it. If Edouard left the lower door unlocked, anyone could come up that stairway. He had another lock in the door of his bedroom, so only someone who was invited could come in, even if she . . . or he . . . could get into the stairway. He was protected.

"Now here is what actually happened last night. I have evidence, by the way, and I have the confessions of both Laird and Lady Duncan. I will explain how I got those confessions in a moment.

"*Primus:* Lady Duncan had an assignation with Count D'Evreux last night. She went up the stairway to his room. She was carrying with her a small pistol. She had had an affair with Edouard, and she had been rebuffed. She was furious. But she went to his room.

"He was drunk when she arrived—in one of the nasty moods with which both of you are familiar. She pleaded with him to accept her again as his mistress. He refused. According to Lady Duncan, he said: 'I don't want you! You're not fit to be in the same room with *her*!'

"The emphasis is Lady Duncan's, not my own.

"Furious, she drew a gun—the little pistol which killed him."

The Countess gasped. "But Mary *couldn't* have—"

"*Please!*" Lord Darcy slammed the palm of his hand on the arm of his chair with an explosive sound. "My lady, you *will* listen to what I have to say!"

He was taking a devil of a chance, he knew. The Countess was his hostess and had every right to exercise her prerogatives. But Lord Darcy was counting on the fact that she had been under Count D'Evreux's influence so long that it would take her a little time to realize that she no longer had to knuckle under to the will of a man who shouted at her. He was right. She became silent.

Father Bright turned to her quickly and said: "Please, my daughter. Wait."

"Your pardon, my lady," Lord Darcy continued smoothly. "I was about to explain to you why I know Lady Duncan could not have killed your brother. There is the matter of the dress. We are certain that the gown that was found in Edouard's closet was worn by the killer. *And that gown could not possibly have fit Lady Duncan!* She's much too . . . er . . . hefty.

"She had told me her story, and, for reasons I will give you later, I believe it. When she pointed the gun at your brother, she really had no intention of killing him. She had no intention of pulling the trigger. Your brother knew this. He lashed out and slapped the side of her head. She dropped the pistol and fell, sobbing, to the floor. He took her roughly by the arm and 'escorted' her down the stairway. He threw her out.

"Lady Duncan, hysterical, ran to her husband.

"And then, when he had succeeded in calming her down a bit, she realized the position she was in. She knew that Laird Duncan was a violent, a warped man—very similar to Edouard, Count D'Evreux. She dared not tell him the truth, but she had to tell him something. So she lied.

"She told him that Edouard had asked her up in order to tell her something of importance; that that 'something of importance' concerned Laird Duncan's safety; that the Count told her that he knew of Laird Duncan's dabbling in black magic; that he threatened to inform Church authorities on Laird Duncan unless she submitted to his desires; that she had struggled with him and ran away."

Lord Darcy spread his hands. "This was, of course, a tissue of lies. But Laird Duncan believed everything. So great was his ego that he could not believe in her infidelity, although he has been paralyzed for five years."

"How can you be certain that Lady Duncan told the truth?" Father Bright asked warily.

"Aside from the matter of the gown—which Count D'Evreux kept only for women of the common class, *not* the aristocracy—we have the testimony of the actions of Laird Duncan himself. We come then to—

"*Secundus:* Laird Duncan could not have committed the murder physically. *How could a man who was confined to a wheelchair go up that flight of stairs?* I submit to you that it would have been physically impossible.

"The possibility that he has been pretending all these years, and that he is actually capable of walking, was disproved three hours ago, when he actually injured himself by trying to throttle me. His legs are incapable of carrying him even one step—much less carrying him to the top of that stairway."

Lord Darcy folded his hands complacently.

"There remains," said Father Bright, "the possibility that Laird Duncan killed Count D'Evreux by psychical, by magical means."

Lord Darcy nodded. "That is indeed possible, Reverend Sir, as we both know. But not in this instance. Master Sean assures me, and I am certain that you will concur, that a man killed by sorcery, by black magic, dies of internal malfunction, not of a bullet through the heart.

"In effect, the Black Sorcerer induces his enemy to kill himself by psychosomatic means. He dies by what is technically known as psychic induction. Master Sean informs me that the commonest—and crudest—method of doing this is by the so-called 'simalcrum induction' method. That is, by the making of an image—usually, but not necessarily, of wax—and, using the Law of Similarity, inducing death. The Law of Contagion is also used, since the fingernails, hair, spittle, and so on, of the victim are usually incorporated into the image. Am I correct, Father?"

The priest nodded. "Yes. And, contrary to the heresies of certain materialists, it is not at all necessary that the vicim be informed of the operation—although, admittedly, it can, in certain circumstances, aid the process."

"Exactly," said Lord Darcy. "But it is well known that material objects can be moved by a competent sorcerer—'black' or 'white'. Would you explain to my lady the Countess why her brother could not have been killed in that manner?"

Father Bright touched his lips with the tip of his tongue and then turned to the girl sitting next to him. "There is a lack of relevancy. In this case, the bullet must have been relevant either to the heart or to the gun. To have traveled with a velocity great enough to penetrate, the relevancy to the heart must have been much greater than the relevancy to the gun. Yet the test, witnessed by myself, that was performed by Master Sean indicates that this was not so. The bullet returned to the gun, not to your brother's heart. The evidence, my dear, is conclusive that the bullet was propelled by purely physical means, and was propelled from the gun."

"Then what was it Laird Duncan did?" the Countess asked.

"*Tertius:*" said Lord Darcy. "Believing what his wife had told him, Laird Duncan flew into a rage. He determined to kill your brother. He used an induction spell. But the spell backfired and almost killed him.

"There are analogies on a material plane. If one adds mineral spirits and air to a fire, the fire will be increased. But if one adds ash, the fire will be put out.

"In a similar manner, if one attacks a living being psychically it will die—but if one attacks a dead thing in such a manner, the psychic energy will be absorbed, to the detriment of the person who has used it.

"In theory, we could charge Laird Duncan with attempted murder, for there is no doubt that he did attempt to kill your brother, my lady. *But your brother was already dead at the time!*

"The resultant dissipation of psychic energy rendered Laird Duncan unconscious for several hours, during which Lady Duncan waited in suspenseful fear.

"Finally, when Laird Duncan regained consciousness, he realized what had happened. He knew that your brother was already dead when he attempted the spell. He thought, therefore, that Lady Duncan had killed the Count.

"On the other hand, Lady Duncan was perfectly well aware that she had left Edouard alive and well. So she thought the black magic of her husband had killed her erstwhile lover."

"Each was trying to protect the other," Father Bright said. "Neither is completely evil, then. There may be something we can do for Laird Duncan."

"I wouldn't know about that, Father," Lord Darcy said. "The Healing Art is the Church's business, not mine." He realized with some amusement that he was paraphrasing Dr. Pateley. "What Laird Duncan had not known," he went on quickly, "was that his wife had taken a gun up to the Count's bedroom. That put a rather different light on her visit, you see. That's why he flew into such a towering rage at me—not because I was accusing him or his wife of murder, but because I had cast doubt on his wife's behavior."

He turned his head to look at the table where the Irish sorcerer was working. "Ready, Master Sean?"

"Aye, my lord. All I have to do is set up the screen and light the lantern in the projector."

"Go ahead, then." He looked back at Father Bright and the Countess. "Master Sean has a rather interesting lantern slide I want you to look at."

"The most successful development I've ever made, if I may say so, my lord," the sorcerer said.

"Proceed."

Master Sean opened the shutter on the projector, and a picture sprang into being on the screen.

There were gasps from Father Bright and the Countess.

It was a woman. She was wearing the gown that had hung in the Count's closet. A button had been torn off, and the gown gaped open. Her right hand was almost completely obscured by a dense cloud of smoke. Obviously she had just fired a pistol directly at the onlooker.

But that was not what had caused the gasps.

The girl was beautiful. Gloriously, ravishingly beautiful. It was not a delicate beauty. There was nothing flowerlike or peaceful in it. It was a beauty that could have but one effect on a normal human male. She was the most physically desirable woman one could imagine.

*Retro mea, Sathanas,* Father Bright thought wryly. *She's almost obscenely beautiful.*

Only the Countess was unaffected by the desirability of the image. She saw only the startling beauty.

"Has neither of you seen that woman before? I thought not," said Lord Darcy. "Nor had Laird or Lady Duncan. Nor Sir Pierre.

"Who is she? We don't know. But we can make a few deductions. She must have come to the Count's room by appointment. This is quite obviously the woman Edouard mentioned to Lady Duncan—the woman, the 'she' that the Scots noblewoman could not compare with. It is almost certain she is a commoner; otherwise she would not be wearing a robe from the Count's collection. She must have changed right there in the bedroom. Then she and the Count quarreled—about what, we do not know. The Count had previously taken Lady Duncan's pistol away from her and had evidently carelessly let it lay on that table you see behind the girl. She grabbed it and shot him. Then she changed clothes again, hung up the robe, and ran away. No one saw her come or go. The Count had designed his stairway for just that purpose.

"Oh, we'll find her, never fear—now that we know what she looks like.

"At any rate," Lord Darcy concluded, "the mystery is now solved to my complete satisfaction, and I shall so report to His Highness."

Richard, Duke of Normandy, poured two liberal portions of excellent brandy into a pair of crystal goblets. There was a smile of satisfaction on his youthful face as he handed one of the goblets to Lord Darcy. "Very well done, my lord," he said. "Very well done."

"I am gratified to hear Your Highness say so," said Lord Darcy, accepting the brandy.

"But how were you so certain that it was *not* someone from outside the castle? Anyone could have come in through the main gate. That's always open."

"True, Your Highness. But the door at the foot of the stairway was *locked*. Count D'Evreux locked it after he threw Lady Duncan out. There is no way of locking or unlocking it from the outside; the door had not been forced. No one could have come in that way, nor left that way, after Lady Duncan was so forcibly ejected. The only other way into the Count's suite was by the other door, and that door was unlocked."

"I see," said Duke Richard. "I wonder why she went up there in the first place?"

"Probably because he asked her to. Any other woman would have known what she was getting into if she accepted an invitation to Count D'Evreux's suite."

The Duke's handsome face darkened. "No. One would hardly expect that sort of thing from one's own brother. She was perfectly justified in shooting him."

"Perfectly, Your Highness. And had she been anyone but the heiress, she would undoubtedly have confessed immediately. Indeed, it was all I could do to keep her from confessing to me when she thought I was going to charge the Duncans with the killing. But she knew that it was necessary to preserve the reputations of her brother and herself. Not as private persons, but as Count and Countess, as officers of the Government of His Imperial Majesty the King. For a man to be known as a rake is one thing. Most people don't care about that sort of thing in a public official so long as he does his duty and does it well—which, as Your Highness knows, the Count did.

"But to be shot to death while attempting to assault his own sister—that is quite another thing. She was perfectly justified in attempting to cover it up. And she will remain silent unless someone else is accused of the crime."

"Which, of course, will not happen," said Duke Richard. He sipped at the brandy, then said: "She will make a good Countess. She has judgment and she can keep cool under duress. After she had shot her own brother, she might have panicked, but she didn't. How many women would have thought of simply taking off the damaged gown and putting on its duplicate from the closet?"

"Very few," Lord Darcy agreed. "That's why I never mentioned that I knew the Count's wardrobe contained dresses identical to her own. By the way, Your Highness, if any good Healer, like Father Bright, had known of those duplicate dresses, he would have realized that the Count had a sexual obsession about his sister. He would have known that all the other women the Count went after were sister substitutes."

"Yes; of course. And none of them could measure up." He put his goblet on the table. "I shall inform the King my brother that I recommended the new Countess wholeheartedly. No word of this must be put down in writing, of course. You know and I know and the King must know. No one else must know."

"One other knows," said Lord Darcy.

"Who?" The Duke looked startled.

"Father Bright."

Duke Richard looked relieved. "Naturally. He won't tell her that *we* know, will he?"

"I think Father Bright's discretion can be relied upon."

In the dimness of the confessional, Alice, Countess D'Evreux knelt and listened to the voice of Father Bright.

"I shall not give you any penance, my child, for you have committed no sin—that is, in so far as the death of your brother is concerned. For the rest of your sins, you must read and memorize the third chapter of 'The Soul and The World,' by St. James Huntington."

He started to pronounce the absolution, but the Countess said:

"I don't understand one thing. That picture. That wasn't me. I never saw such a gorgeously beautiful girl in my life. And I'm so plain. I don't understand."

"Had you looked more closely, my child, you would have seen that the face did look like yours—only it was idealized. When a subjective reality is made objective, distortions invariably show up; that is why such things cannot be accepted as evidence of objective reality in court." He paused. "To put it another way, my child: Beauty is in the eye of the beholder. ■

# POPPA NEEDS SHORTS

Given valid data, you can reach completely wrong conclusions. But given a wrong conclusion, you can still get a right answer!

### WALT and LEIGH RICHMOND

Illustrated by John Schoenherr

Little Oley had wandered into forbidden territory again—Big Brother Sven's ham shack. The glowing bottles here were an irresistible lure, and he liked to pretend that he knew all there was to know about the mysteries in this room.

Of course, Sven said that not even *he* knew all of the mysteries, though he admitted he was one of the best ham operators extant, with QSOs from eighteen countries and thirty-eight states to his credit.

At the moment, Sven was busily probing into an open chassis with a hot soldering iron.

"Short's in here some place," he muttered.

"What makes shorts, Sven?" Oley wasn't so knowledgeable but what he would ask an occasional question.

Sven turned and glared down. "What are you doing in here? You know it's a Federal Offense for anybody to come into this room without I say so?"

"Momma and Hilda come in all the time, and you don't say so." Oley stood firm on what he figured were legal grounds. "What makes shorts?"

Sven relented a little. This brother had been something of a surprise to him, coming along when Sven was a full ten years old. But, he reflected, after a few years maybe I should get used to the idea. Actually, he sort of liked the youngster.

"Shorts," he said, speaking from the superior eminence of his fourteen years to the four-year-old, "is when electricity finds a way to get back where it came from without doing a lot of hard work getting there. But you see, electricity likes to work; so, even when it has an easy way, it just works harder and uses itself up."

This confused explanation of shorts was, of course, taken verbatim, despite the fact that Oley couldn't define half the words and probably couldn't even pronounce them.

"I don't like shorts. I don't like these pink shorts Momma put on me this morning. Is they electrics, Sven?"

Sven glanced around at the accidentally-dyed-in-the-laundry, formerly white shorts.

"Um-m-m. Yeah. You could call 'em electric."

With this Oley let out whoop and dashed out of the room, trailing a small voice behind him. "Momma, Momma. Sven says my shorts is electric!"

"I'll short Sven's electrics for him, if he makes fun of your shorts!" Oley heard his mother's comforting reply.

In the adult world days passed before Oley's accidentally acquired pattern of nubient information on the subject of shorts was enlarged. It was only days in the adult world, but in Oley's world each day was a mountainous fraction of an entire lifetime, into which came tumbling and jumbling—or were pulled—bits, pieces, oddments, landslides and acquisitions of information on every subject that he ran into, or that ran into him. Nobody had told Oley that acquiring information was his job at the moment; the acquisition was partly accidental, mostly instinctive, and spurred by an intense curiosity and an even more intense determination to master the world as he saw it.

There was the taste of the sick green flowers that Momma kept in the window box and, just for a side course, a little bit of the dirt, too. There were the patterns of the rain on the window, and the reactions of a cat to having its tail pulled. The fact that you touch a stove one time, and it's cool and comfortable to lay your head against, and another time it hurts. Things like that. And other things—towering adults who sometimes swoop down on you and throw you high into the air; and most times walk over you, around you, and ignore you completely. The jumble of assorted and unsorted information that is the heritage of every growing young inquiring brain.

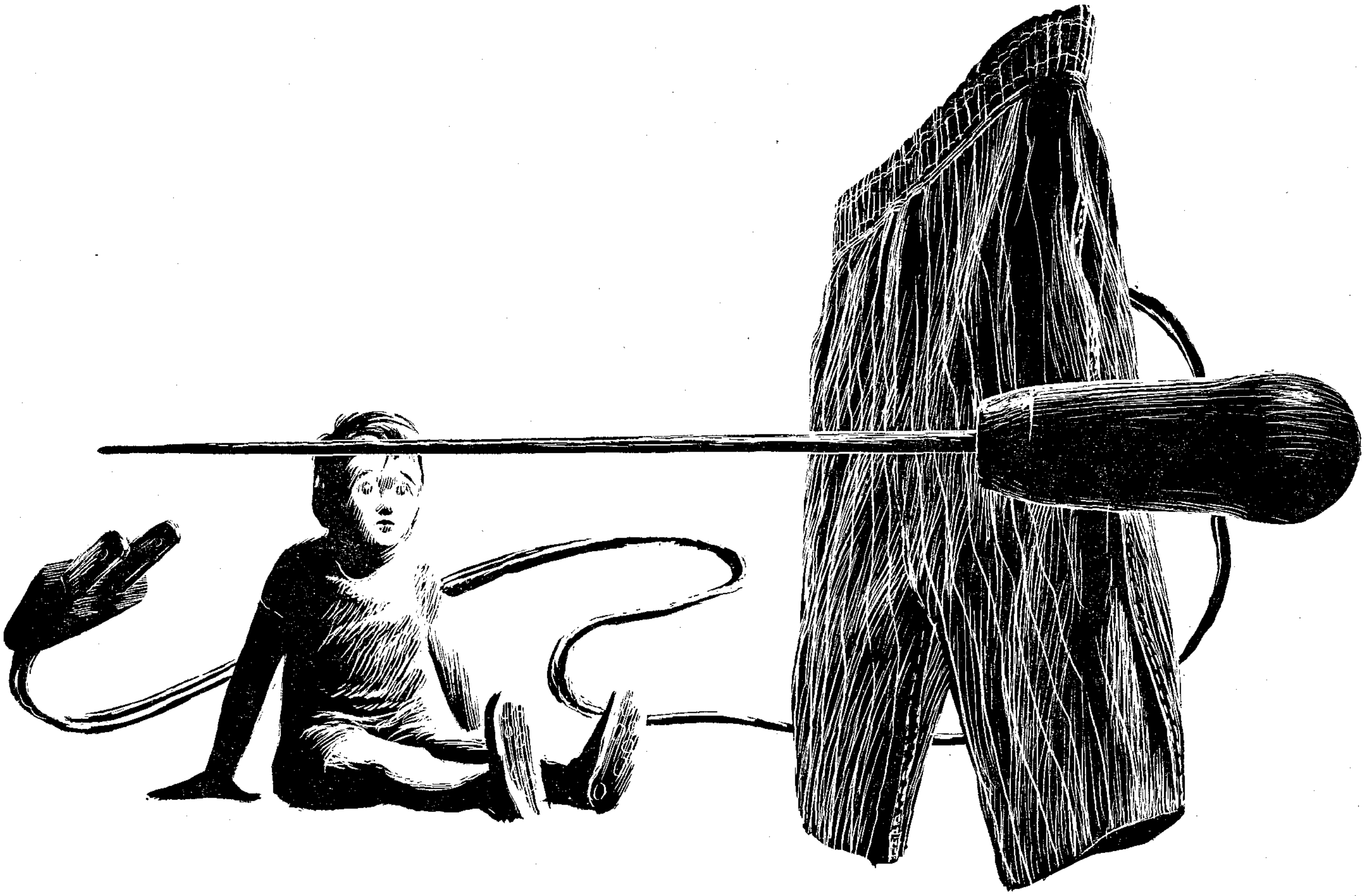
In terms of time, it was only a couple of weeks, if you were looking at it as an adult, until the next "shorts" incident.

Oley was sitting peacefully at the breakfast table, doing his level best to control the manipulation of the huge knife-fork-and-spoon, plate-bowl-and-glass, from which he was expected to eat a meal. Things smelled good. Momma was cooking doste, and that to Oley smelled best of all. The doster ticked quietly to itself, then gave a loud pop, and up came two golden-brown slices of doste. Dostes? Oley wasn't sure. But he hadn't really begun paying too much attention to whether one doste was the same as two doste or what, though he could quite proudly tell you the difference between one and two.

Out it came, and fresh butter was spread on it, and in went two shiny white beds, for some more doste.

Little Oley watched in fascination. And now he reached for the tremendous glass sitting on the table in front of him. But his fingers didn't quite make it. Somehow, the glass was heavy and slippery, and it eluded him, rolled over on its side, and spilled the bright purple juicy contents out across the table in a huge swish.

Oley wasn't dismayed, but watched with a researcher's



interest as the bright purple juice swept across the table towards the busily ticking doster. Momma, of course, wasn't here, or she would have been gruff about it. She'd just gone into the other room.

The juice spread rapidly at first, and then more and more slowly, making a huge, circuitous river spreading across the table, first towards the doster and then away from it towards the frayed power-cord lying on the table. It touched and began to run along the cord. Not a very eventful recording so far, but Oley watched, charmed.

As he watched, a few bubbles began to appear near the frayed spot. A few wisps of steam. And then, suddenly, there was a loud, snarling splatt—and Momma screamed from the doorway. "That juice is making a short!"

The information, of course, was duly recorded. Juice makes shorts.

It was a minor item of information, mixed into a jumble of others, and nothing else was added to this particular file for nearly another week.

Oley was playing happily on the living room floor that night. Here there was much to explore, though an adult might not have thought twice about it. Back in the corner behind Momma's doing bachine a bright, slender piece of metal caught Oley's attention. Bigger on one end than the other, but not really very big anywhere, the sewing machine needle proved fascinating. As a first experiment, Oley determined that it worked like a tooth by biting himself with it. After that he went around the room, biting other things with it. Information, of course, is information, and to be obtained any way one can.

The brown, snaky lamp cord was the end of this experiment. Oley bit it, viciously, with his new tooth, and had only barely observed that it had penetrated completely through when there was a loud splatt, and all the lights in the room went out.

In the darkness and confusion, of course, Oley moved away, seeking other new experiences. So the cause of the short that Momma and Poppa yakked so loudly about was never attributed to Oley's actions, but only to "How could a needle have gotten from your sewing machine into this lamp cord, Alice?"

But the sum of information had increased. Neatles stuck into lamp cords had something to do with shorts.

More time passed. And this time the file on shorts was stimulated by Poppa. The big, rough, booming voice had always scared Oley a bit when it sounded mad, like now.

"Alice, I've just *got* to have some more shorts!"

Poppa was rummaging in a drawer far above Oley's head, so he couldn't see the object under discussion. But all he already knew about shorts—the information passed in review before him.

Shorts are useful. They help electrics to work harder.

Shorts you wear, and they are electrics.

Wires are electrics.

Shorts can be made by juice.

Shorts can be made by neatles, that bite like teeth.

Poppa needs more shorts.

But Oley wasn't motivated to act at the moment. Just sorting out information and connecting it with other information files in the necessarily haphazard manner that might eventually result in something called intelligence, although he didn't know that yet.

It was a week later in the kitchen, when Momma dropped a giant version of the neatle on the floor, that his information file in this area increased again.

"Is that a neatle?" Oley asked.

His mother laughed quietly and looked fondly at her son as she put the ice pick back on the table.

"I guess you could call it a needle, Oley," she told him. "An ice needle."

Oley instinctively waited until Momma's back was turned before taking the nice neatle to try its biting powers; and instinctively took it out of the kitchen before starting his experiments.

As he passed the cellar door he heard a soft gurgling and promptly changed course. Pulling open the door with difficulty, he seated himself on the cellar stairs to watch a delightful new spectacle—frothing, gurgling water making its way across the floor towards the stairs. It looked wonderfully dirty and brown, and to Oley it was an absorbing phenomenon. It never occurred to him to tell Momma.

Suddenly above him the cellar door slammed open, and Poppa came charging down the stairs, narrowly missing the small figure, straight into the rising waters, intent, though Oley couldn't know it, on reaching the drain pipe in the far corner of the cellar to plug it before water from the spring rains could back up farther and really flood the cellar out.

Halfway across the cellar, Poppa reached up and grasped the dangling overhead light to turn in on, in order to see his way to the drain—and suddenly came to a frozen, rigid, gasping stop as his hand clamped firmly over the socket.

Little Oley watched. There was juice in the cellar. Poppa had hold of an electric. Was Poppa trying to make the shorts he needed?

Oley wasn't sure. He thought it probable. And from the superior knowledge of his four years, Oley already knew a better way to make shorts. Neatles make good shorts. Juice don't do so well.

Suddenly, Oley decided to prove his point. Nice neatles probably made even better shorts than other neatles—and there was a big electric running up the side of the stairs—an electric fat enough to make a real good shorts. Maybe lots of shorts.

Raising his nice neatle, Oley took careful aim and plunged it through the 220 volt stove feeder cable.

Oley woke up. The strange pretty lady in white was a new experience. Somebody he hadn't seen before. And there seemed to be something wrong with his hand, but Oley hadn't noticed it very much, yet.

"Well, my little Hero's awake! And how are you this morning? Your Momma and Poppa will be in to see you in just a minute."

The pretty lady in white went away, and Oley gazed around the white room with its funny shape, happily recorded the experience, and dozed off again.

Then suddenly he was awakened again. Momma was there; and Poppa. And Sven. But they all seemed different somehow this morning. Momma had been crying, even though she was smiling bravely now. And Poppa seemed to have a new softness that he'd seldom seen before. Sven was looking puzzled.

"I still say, Pop, that he's a genius. He *must* have known what he was doing."

"Oley," Poppa's voice was husky—gruff, but kinder and softer than usual. "I want you to answer me carefully. But understand that it's all right either way. I just want you to tell me. Why did you put the ice pick through the stove cable? You saved my life, you know. But I'd like to know how you knew how."

Little Oley grinned. His world was peaceful and wonderful now. And all the big adults were bending and leaning down and talking to him.

"Nice neatle," he said. "Big electric. Poppa needed shorts." ■

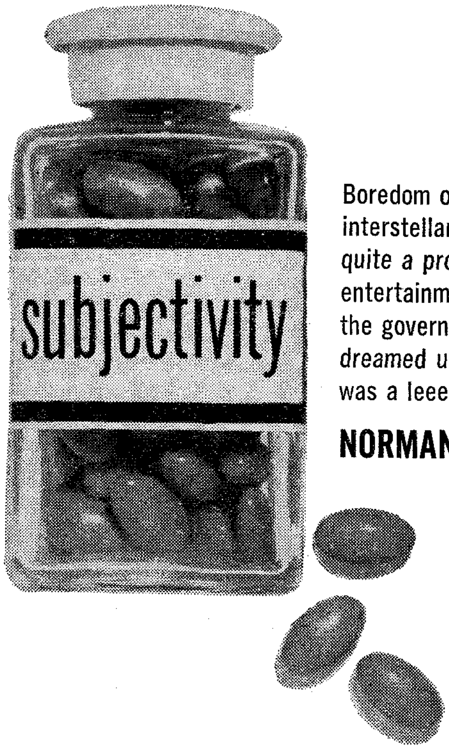
## IN TIMES TO COME

*Next month Dean McLaughlin—who's been missing from our pages for a while; he does other things than write science-fiction!—is back with a story "The Permanent Implosion". Concerns a scientific experiment that worked more than slightly too well. A sort of "Pandora's Box" in reverse, they opened something they couldn't close again—but it wasn't what came out that bothered them, but what went in.*

*The main problem of the story, however, actually concerns the difference in the thinking-approach of the pure-scientist type, and the utterly pragmatic approach of the hard-boiled, horny-handed contractor type the scientist called in when things went most egregiously wrong.*

*Incidentally—though this information doesn't really belong here—that little symbol we have between "Science Fact" and "Science Fiction" on our cover this month, next month, and every month, is a home-invented one. In all mathematics, etcetera, there are symbols for "equals," "greater than," "similar to"—but no symbol meaning "is analogous to". We invented one—that semicircle-with-an-arrow is it.*

*We do not expect our faithful readers to enunciate our title clearly as "ANALOG—Science Fact is analogous to Science Fiction" but we thought you might be interested in why we did not use the traditional ampersand—&.* The Editor.



# subjectivity

Boredom on a long, interstellar trip can be quite a problem . . . but the entertainment technique the government *dreamed up for this one* was a leeetle too good . . . !

**NORMAN SPINRAD**

Illustrated by
Leo Summers

Interplanetary flight having been perfected, the planets and moons of the Sol system having been colonized, Man turned his attention to the stars.

And ran into a stone wall.

After three decades of trying, scientists reluctantly concluded that a faster-than-light drive was an impossibility, at least within the realm of any known theory of the Universe. They gave up.

But a government does not give up so easily, especially a unified government which already controls the entire habitat of the human race. *Most* especially a psychologically and sociologically enlightened government which sees the handwriting on the wall, and has already noticed the first signs of racial claustrophobia—an objectless sense of frustrated rage, increases in senseless crimes, proliferation of perversions and vices of every kind. Like grape juice sealed in a bottle, the human race had begun to ferment.

Therefore, the Solar Government took a slightly different point of view towards interstellar travel—Man *must* go to the stars. Period. Therefore, Man *will* go to the stars.

If the speed of light could not be exceeded, then Man would go to the stars within that limit.

When a government with tens of billions of dollars to spend becomes monomaniacal, Great Things can be accomplished. Also, unfortunately, Unspeakable Horrors.

*Stage One:* A drive was developed which could propel a spaceship at half the speed of light. This was merely a matter of technological concentration, and several billion dollars.

*Stage Two:* A ship was built around the drive, and outfitted with every conceivable safety device. A laser-beam communication system was installed, so that Sol could keep in contact with the ship all the way to Centaurus. A crew of ten carefully screened, psyched and trained near-supermen was selected, and the ship was launched on a sixteen-year round-trip to Centaurus.

It never came back.

Two years out, the ten near-supermen became ten raving maniacs.

But the Solar Government did not give up. The next ship contained five near-supermen, and five near-superwomen.

They only lasted for a year and a half.

The Solar Government intensified the screening process. The next ship was manned by ten bona-fide supermen.

They stayed sane for nearly three years.

The Solar Government sent out a ship containing five supermen and five superwomen. In two years, they had ten super-lunatics.

The psychologists came to the unstartling conclusion that even the cream of humanity, in a sexually balanced crew, could not stand up psychologically to sixteen years in a small steel womb, surrounded by billions of cubic miles of nothing.

One would have expected reasonable men to have given up.

Not the Solar Government. Monomania had produced Great Things, in the form of a c/2 drive. It now proceeded to produce Unspeakable Horrors.

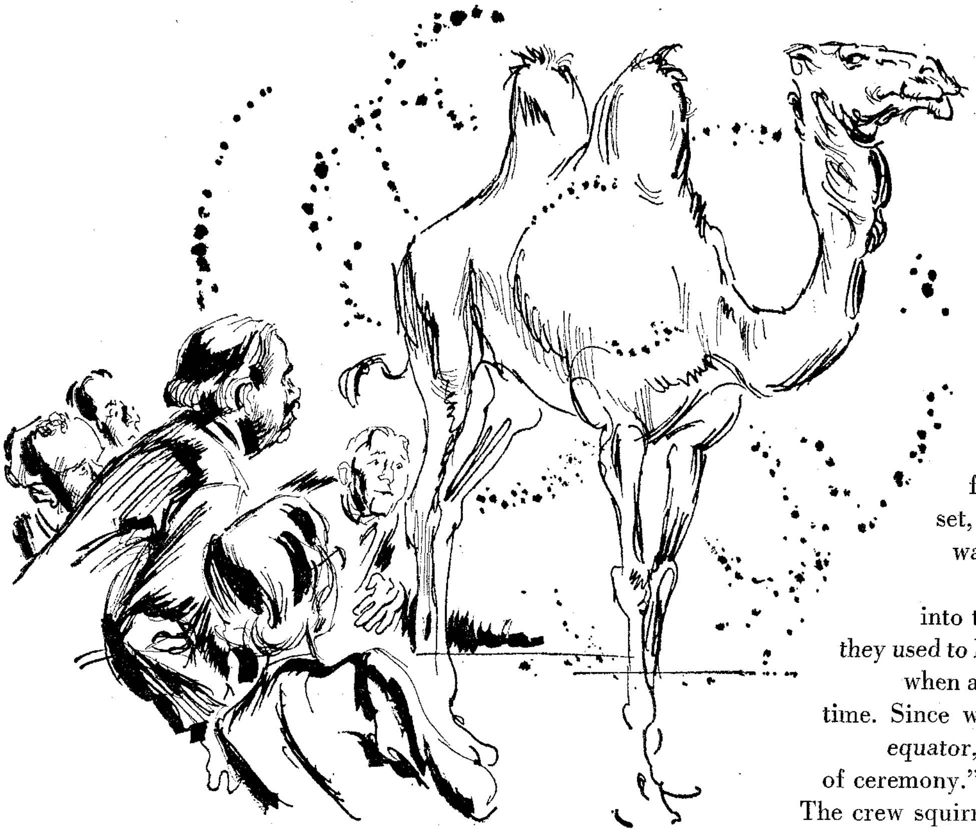
The cream of the race has failed, reasoned the Solar Government, therefore, we will give the dregs a chance.

The fifth ship was manned by homosexuals. They lasted only six months. A ship full of lesbians bettered that by only two weeks.

Number Seven was manned by schizophrenics. Since they were *already* mad, they did not go crazy. Nevertheless, they did not come back. Number Eight was catatonics. Nine was paranoids. Ten was sadists. Eleven was masochists. Twelve was a mixed crew of sadists and masochists. No luck.

Maybe it was because thirteen was still a mystic number, or maybe it was merely that the Solar Government was running out of ideas. At any rate, ship Number Thirteen was the longest shot of all.

*Background:* From the beginnings of Man, it had been known that certain plants—mushrooms, certain cacti—produced intense hallucinations. In the mid-twentieth century, scientists—and others less scientifically minded—had begun to extract those hallucinogenic compounds, chiefly mescalin and pcilicibin. The next step was the synthesis of hallucinogens—L.S.D. 25 was the first, and



it was far more powerful than the extracts.

In the next few centuries, more and more different hallucinogens were synthesized—L.S.D. 105, Johannic acid, huxleyon, baronite.

So by the time the Solar Government had decided that the crew of ship Number Thirteen would attempt to cope with the terrible reality of interstellar space by denying that reality, they had quite an assortment of hallucinogens to choose from.

The one they chose was a new, as-yet-untested ("Two experiments for the price of one," explained economy-minded officials) and unbelievably complex compound tentatively called Omnidrene.

Omnidrene was what the name implied—a hallucinogen with all the properties of the others, some which had proven to be all its own, and some which were as yet unknown. As ten micrograms was one day's dose for the average man, it was the ideal hallucinogen for a starship.

So they sealed five men and five women—they had given up on sexually unbalanced crews—in ship Number Thirteen, along with half a ton of Omnidrene and their fondest wishes, pointed the ship towards Centaurus, and prayed for a miracle.

In a way they could not possibly have foreseen, they got it.

As starship Thirteen passed the orbit of Pluto, a meeting was held, since this could be considered the beginning of interstellar space.

The ship was reasonably large—ten small private cabins, a bridge that would only be used for planetfalls, large storage areas, and a big common room, where the crew had gathered.

They were sitting in All-Purpose Lounges, arranged in a circle. A few had their Lounges at full recline, but most preferred the upright position.

Oliver Brunei, the nominal captain, had just opened the first case of Omnidrene, and taken out a bottle of the tiny pills.

"This, fellow inmates," he said, "is Omnidrene. The time has come for us to indulge. The automatics are all set, we won't have to do a thing we don't want to for the next eight years."

He poured ten of the tiny blue pills into the palm of his right hand. "On Earth, they used to have some kind of traditional ceremony when a person crossed the equator for the first time. Since we are crossing a far more important equator, I thought we should have some kind of ceremony."

The crew squirmed irritably.

I *do* tend to be verbose, Brunei thought.

"Well . . . anyway, I just thought we all oughta take the first pills together," he said, somewhat defensively.

"So come on, Ollie," said a skinny, sour-looking man of about thirty years.

"O.K., Lazar, O.K." Marashovski's gonna be trouble, Brunei thought. Why did they put *him* on the ship?

He handed the pills around. Lazar Marashovski was about to gulp his down.

"Wait a minute!" said Brunei. "Let's all do it together.

"One, two, *three!*"

They swallowed the pills. In about ten minutes, thought Brunei, we should be feeling it.

He looked at the crew. Ten of us, he thought, ten brilliant misfits. Lazar, who has spent half his life high on baronite; Vera Galindez, would-be medium, trying to make herself telepathic with mescalin; Jorge Donner . . . Why is *he* here?

Me, at least with me it's simple—this or jail.

What a crew! Drug addicts, occultists, sensationalists . . . *and what else?* What makes a person do a thing like this?

It'll all come out, thought Brunei. In sixteen years, it'll all come out.

"Feel anything yet, Ollie?" said Marsha Johnson. No doubt why *she* came along. Just an ugly old maid liking the idea of being cooped up with five men.

"Nothing yet," said Brunei.

He looked around the room. Plain steel walls, lined with cabinets full of Omnidrene on two sides, viewscreen on the ceiling, bare floor, the other two walls decked out like an automat. Plain, gray steel walls . . .

*Then why were the gray steel walls turning pink?*

"Oh, oh . . ." said Joby Krail, rolling her pretty blond head, "oh, oh . . . here it comes. The walls are dancing . . ."

"The ceiling is a spiral," muttered Vera, "a winding red spiral."

"O.K., fellow inmates," said Brunei, "it's hitting." Now the walls were red, bright fire-engine red, and they were melting. No, not melting, but evaporating . . .

"Like crystal it is," said Lin Pey, waving his delicate oriental hands, "like jade as transparent as crystal."

"There is a camel in the circle," said Lazar, "a brown camel."

"Let's all try and see the camel together," said Vera Galindez sharply. "Tell us what it looks like, Lazar."

"It's brown, it's the two-humped kind, it has a two-foot tail."

"And big feet," said Lin Pey.

"A stupid face," said Donner.

"Very stupid."

"Your camel is a great bore," said the stocky, scowling Bram Daker.

"Let's have something else," said Joby.

"Okay," replied Brunei, "now someone else tell what they see."

"A lizard," said Linda Tobias, a strange, somber girl, inclined to the morbid.

"A lizard?" squeaked Ingrid Solin.

"No," said Lin Pey, "a dragon. A green dragon, with a forked red tongue . . ."

"He has little useless wings," said Lazar.

"He is totally oblivious to us," said Vera.

Brunei saw the dragon. It was five feet long, green and scaly. It was a conventional dragon, except for the most bovin expression in its eyes . . .

Yes, he thought, the dragon is *here.* But the greater part of him knew that it was an illusion.

How long would this go on?

"It's *good* that we see the same things," said Marsha. "Let's always see the same things . . ."

"Yes."

"Yes!"

"Now, a mountain, a tall blue mountain."

"With snow on the peak."

"Yes, and clouds . . ."

*One week out:*

Oliver Brunei stepped into the common room. Lin Pey, Vera, and Lazar were sitting together, on what appeared to be a huge purple toadstool.

But that's *my* hallucination, thought Brunei. *At least, I think it is.*

"Hello Ollie," said Lazar.

"Hi. What're you doing?"

"We're looking at the dragon again," said Vera. "Join us?"

Brunei thought of the dragon for a moment. The toadstool disappeared, and the by-now-familiar bovine dragon took its place. In the last few days, they had discovered that if any two of them concentrated on something long enough to "materialize" it, anyone else who wanted to could see it in a moment.

"What's so interesting about that silly dragon?" said Brunei.

"How about the camel?" said Lazar.

The dragon turned into the two-humped brown camel.

"Phooey!" said Lin Pey.

"O.K.," said Vera, "so what do *you* want?"

Lin Pey thought for a monent.

"How about a meadow?" he said. "A soft lawn of green grass, the sky is blue, and there are a few white clouds . . ."

"Clover is blooming," said Lazar. "Smell it."

Brunei reclined on the soft green grass. The smell of the earth beneath him was warm and moist. "A few apple trees here and there," he said, and there was shade.

"Look over the hill!" said Lazar. "There's the dragon!"

"Will you *please* get rid of that dragon?" snapped Brunei.

"O.K., Ollie, O.K."

*One month out:*

"Get out of the way!" yelled Brunei. He gave the dragon a kick. It mooed plaintively.

"That wasn't very nice, Ollie," said Lazar.

"That dragon is always underfoot," said Brunei. "Why don't you get rid of it?"

"I've taken a liking to it," said Lazar. "Besides, what about your Saint Bernard?"

"This ship is getting too cluttered up with everyone's hallucinations," said Brunei. "Ever since . . . when was it, a week ago? . . . ever since we've been able to conjure 'em up by ourselves, and make everyone else see 'em."

Daker dematerialized the woman on his lap. "Why don't we get together?" he said.

"Get together?"

"Yes. We could agree on an environment. Look at this common room for example. What a mess! Here, it's a meadow, there it's a beach, a palace, a boudoir."

"You mean we should make it the same for all of us?" asked Lazar.

"Sure. We can have whatever we want in our cabins, but let's make some sense out of the common room."

"Good idea," said Brunei. "I'll call the others."

*Three months out:*

Brunei stepped through the stuccoed portal, and into the central Spanish garden. He noticed that the sky was blue, with a few fleecy white clouds.

But then, the weather was always good. They had agreed on it.

Lazar, Ingrid, Lin Pey and Vera were sitting on the green lawn surrounding the fountain.

Daker, Joby, Linda and Donner preferred the shade, and lounged against the white arabesqued wall which enclosed the garden on four sides, broken only by four arched entrance portals.

The garden had been a good compromise, thought Brunei. Something for everyone. Fresh air and sunshine, but also the mental security offered by the walls, which also provided shade for those who wanted it. A fountain, a few palm trees, grass, flowers, even the little formal Japanese rock garden that Lin Pey had insisted on.

"Hello, Ollie," said Lazar. "Nice day."

"Isn't it always?" replied Brunei. "How about a little shower?"

"Maybe tomorrow."

"I notice a lot of sleeping people today," said Brunei.

"Yes," said Lin Pey. "By now, the garden seems to be able to maintain itself."

"You think it has a separate existence?" asked Ingrid.

"Of course not," said Vera. "Our subconscious minds are maintaining it. It's probably here when we're all asleep."

"No way of telling *that*," said Brunei. "Besides, how can it exist when we're asleep, when it doesn't really begin to begin with?"

"Semantics, Ollie, semantics."

Brunei took a bottle of Omnidrene out of his pocket. "Time to charge up the old batteries again," he said.

He passed out the pills.

"I notice Marsha is still in her cabin."

"Yeah," said Lazar, "she keeps to herself a lot. No great—"

Just then, Marsha burst into the garden, screaming: "Make it go away! Make it go away!"

Behind her slithered a gigantic black snake, with a head as big as a horse's, and bulging red eyes.

"I thought we agreed to leave our private hallucinations in our cabins," snapped Brunei.

"I tried! I tried! I *don't want* it around, but it won't go away! Do something!"

Ten feet of snake had already entered the garden. The thing seemed endless.

"Take it easy," said Lazar. "Let's all concentrate and think it away."

They tried to erase the snake, but it just rolled its big red eyes.

"That won't work," said Vera. "Her subconscious is still fighting us. Part of her must *want* the snake here. We've *all* got to be together to erase it."

Marsha began to cry. The snake advanced another two feet.

"Oh, quiet!" rasped Lazar. "Ollie, do I have your permission to bring my dragon into the garden? He'll make short work of the snake."

Brunei scowled. "You and your dragon . . . Oh, maybe it'll work."

Instantly, the green dragon was in the garden. But it was no longer five feet long and bovine.

It was a good *twelve* feet long, with cold reptilian eyes and big yellow fangs.

It took one look at the snake, opened its powerful jaws, and belched a huge tongue of orange flame.

The serpent was incinerated. It disappeared.

Brunei was trembling. "What happened, Lazar?" he said. "That's not the same stupid little dragon."

"Hah . . . hah . . ." squeaked Lazar. "He's . . . uh . . . grown . . ."

Brunei suddenly noticed that Lazar was ashen. He also noticed that the dragon was turning in their direction.

"Get it out of here, Lazar! Get it out of here!"

Lazar nodded. The dragon flickered and went pale, but it was over a minute before it disappeared entirely.

*Six months out:*

*Things* wandered the passageways and haunted the cabins. Marsha's snake was back. There was Lazar's dragon, which seemed to grow larger every day. There was also a basilisk, a pterodactyl, a vampire bat with a five-foot wingspread, an old-fashioned red spade-tailed demon and other assorted horrors.

Even Oliver Brunei's friendly Saint Bernard had grown to monstrous size, turned pale green, and grown large yellow fangs.

Only the Spanish garden in the common room was free of the monstrosities. Here, the combined conscious minds of the ten crew members were still strong enough to banish the rampaging hallucinations.

The ten of them sat around the fountain, which seemed a shade less sparkling.

There were even rainclouds in the sky.

"I don't like it," said Bram Daker. "It's getting completely out of control."

"So we just have to stay in the garden, that's all," said Brunei. "The food's all here, and so is the Omindrene. And *they* can't come here."

"Not yet," said Marsha.

They all shuddered.

"What went wrong?" asked Ingrid.

"Nothing," said Donner. "They didn't know what would happen when they sent us out, so we can't say they were *wrong*."

"Very comforting," croaked Lazar. "But can someone tell me why we can't control *them* any more?"

"Who knows?" said Brunei. "At least we can keep them out of here. That's—"

There was a snuffling at the wall. The head of something like a Tyrannosaurus Rex peered over the wall at them.

"Ugh!" said Lin Pey. "I think that's a new one."

The dragon's head appeared alongside the Tyrannosaur's.

"Well, at least *there's* a familiar face," tittered Linda.

"Very funny."

Marsha screamed. The huge black snake thrust its head through a portal.

And the flap of leathery wings could be heard. And the smell of sulphur.

"Come on! Come on!", shouted Brunei. "Let's get these things out of here!"

After five minutes of intense group concentration, the last of the horrors was banished.

"It was a lot harder this time," said Daker.

"There were more of them," said Donner.

"They're getting stronger and bolder."

"Maybe some day they'll break through, and . . ." Lin Pey let the sentence hang. Everyone supplied his own ending.

"Don't be ridiculous!" snapped Brunei. "They're not real. *They can't kill us!*"

"Maybe we should stop taking the Omnidrene?" suggested Vera, without very much conviction.

"At *this* point?" said Brunei. He shuddered. "If the garden disappeared, and we had nothing but the bare ship for the next fifteen and a half years, and we *knew* it, and at the same time knew that we had the Omnidrene to bring it back . . . How long do you think we'd hold off?"

"You're right," said Vera.

"We just have to stick it out," said Brunei. "Just remember: *They can't kill us. They aren't real.*"

"Yes," the crew whispered in a tiny, frail voice, "they aren't real . . ."

*Seven months out:*

The garden was covered with a gloomy gray cloud layer. Even the "weather" was getting harder and harder to control.

The crew of starship Number Thirteen huddled around the fountain, staring into the water, trying desperately to ignore the snufflings, flappings, wheezes and growls coming from outside the walls. But occasionally, a scaly head would raise itself above the wall, or a pterodactyl or bat would flap overhead, and there would be violent shudders.

"I still think we should stop taking the Omnidrene," said Vera Galindez.

"If we stopped taking it," asked Brunei, "which would disappear first, *them . . . or the garden?*"

Vera grimaced. "But we've got to do something," she said. "We can't even make them disappear at all, any more. And it's becoming a full time job just to keep them outside the walls."

"And sooner or later," interjected Lazar, "we're *not* going to be strong enough to keep them out . . ."

*"Brr!"*

"The snake! The snake!" screamed Marsha. "It's coming in again!"

The huge black head was already through a portal.

"Stop the snake, everyone!" yelled Brunei. Eyes were riveted on the ugly serpent, in intense concentration.

After five minutes, it was obviously a stalemate. The snake had not been able to advance, nor could the humans force it to retreat.

Then smoke began to rise behind the far wall.

"The dragon's burning down the wall!" shrieked Lazar. "Stop him!"

They concentrated on the dragon. The smoke disappeared.

But the snake began to advance again.

"They're too strong!" moaned Brunei. "We can't hold them back."

They stopped the snake for a few moments, but the smoke began to billow again.

"They're gonna break through!" screamed Donner. "We can't stop 'em!"

"What are we gonna do?"

"Help!"

Creakings, cracklings, groanings, as the walls began to crack and blister and shake.

Suddenly Bram Daker stood up, his dark eyes aflame.

"Only one thing's strong enough!" he bellowed. "Earth! *Earth!* EARTH! Think of Earth! All of you! We're back on Earth. Visualize it, make it real, and the monsters'll have to disappear."

"But *where* on Earth?" said Vera, bewildered.

"The Spaceport!" shouted Brunei. "The Spaceport! We all remember the Spaceport."

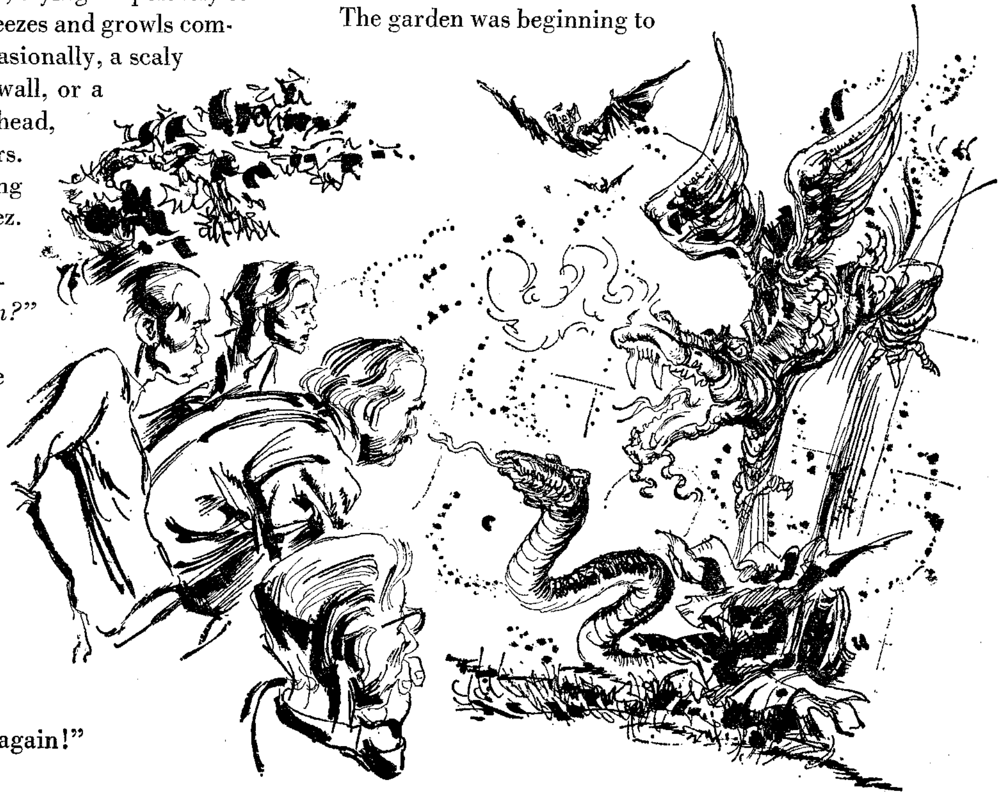
"We're back on Earth! The Spaceport!"

"Earth!"

*"Earth!"*

"EARTH! EARTH!"

The garden was beginning to



flicker. It became red, orange, yellow, green, blue, violet, invisible; then back again through the spectrum the other way—violet, blue, green, yellow, orange, red, invisible.

Back and forth, like a pendulum through the spectrum . . .

Oliver Brunei's head hurt unbearably, he could see the pain on the other faces, but he allowed only one thought to fill his being—*Earth! The Spaceport! EARTH!*

More and more, faster and faster, the garden flickered, and now it was the old common room again, and *that* was flickering.

Light was flickering, mind was flickering, time, too, seemed to flicker . . .

*Only Earth!* thought Brunei. Earth doesn't flicker, the Spaceport doesn't flicker.

Earth! EARTH!

Now all the flickerings, of color, time, mind and dimensions, were coalescing into one gigantic vortex, that was a thing neither of time, nor space, nor mind, but all three somehow fused into one . . .

They're screaming! Brunei thought. Listen to the horrible screams! Suddenly he noticed that he, too, was screaming.

The vortex was growing, swirling, undulating, and it, too, began to flicker . . .

There was an unbearable, impossible pain, and . . .

The sight of starship Number Thirteen suddenly appearing out of nowhere, and sitting itself calmly down in the middle of the Spaceport was somewhat disconcerting to the Spaceport officials. Especially since at the very moment it appeared, and even afterward, they continued to have visual and laser contact with its image, over three light-months from Earth.

However, the Solar Government itself was much more pragmatic. One instant, starship Thirteen had been light-months from Earth, the next it was sitting in the Spaceport. Therefore, starship Thirteen had exceeded the speed of light somehow. Therefore, it was possible to exceed the speed of light, and a thorough examination of the ship and its contents would show *how.*

Therefore . . . You idiots, throw a security cordon around that ship!

In such matters, the long-conditioned reflexes of the Solar Government worked marvelously. Before the airwaves had cooled, two hundred heavily armed soldiers had surrounded the ship.

Two hours later, the Solar co-ordinator was on the scene, with ten Orders of Sol to present to the returning heroes, and a large well-armored vehicle to convey them to laboratories, where they would be gone over with the proverbial fine-tooth comb.

An honor guard of two hundred men standing at attention made a pathway from the ship's main hatch to the armored carrier, in front of which stood the Solar Co-ordinator, with his ten medals.

They opened the hatch.

One, two, five, seven, ten dazed and bewildered "heroes" staggered past the honor guard, to face the Co-ordinator.

He opened his mouth to begin his welcoming speech, and start the five years of questioning and experiments which would eventually kill five of the crew and give Man the secret of faster-than-light drive.

But instead of speaking, he screamed.

So did two hundred heavily armed soldiers.

Because, out of starship Thirteen's main hatch sauntered a twelve-foot green dragon, followed by a Tyrannosaurus Rex, a pterodactyl, a vampire bat with a five-foot wingspan, an old-fashioned red, spade-tailed demon, and finally, big as a horse's, the pop-eyed head of an enormous black serpent . . . ■

## THE ANALYTICAL LABORATORY

*It's necessary, every so often, to repeat for new readers the technique used in preparing this An Lab—and what it means to authors.*

*Readers—like you, please!—send in letters and/or cards listing the stories in order of preference. We keep a chart, entering each reader's votes against the story. If you vote "The Three-Cornered Wheel" the best in the issue, list it as #1 story; then on the chart "The Three-Cornered Wheel" gets a "1". If you list it as third, it would get a "3".*

*When An Lab preparation times comes, the votes entered for each story are added up, and divided by the number of votes. If—improbable in the extreme—every voter cast a #1 vote for a story, and say two hundred fifty people voted, there would be a net point score of 250/250 = 1.000.*

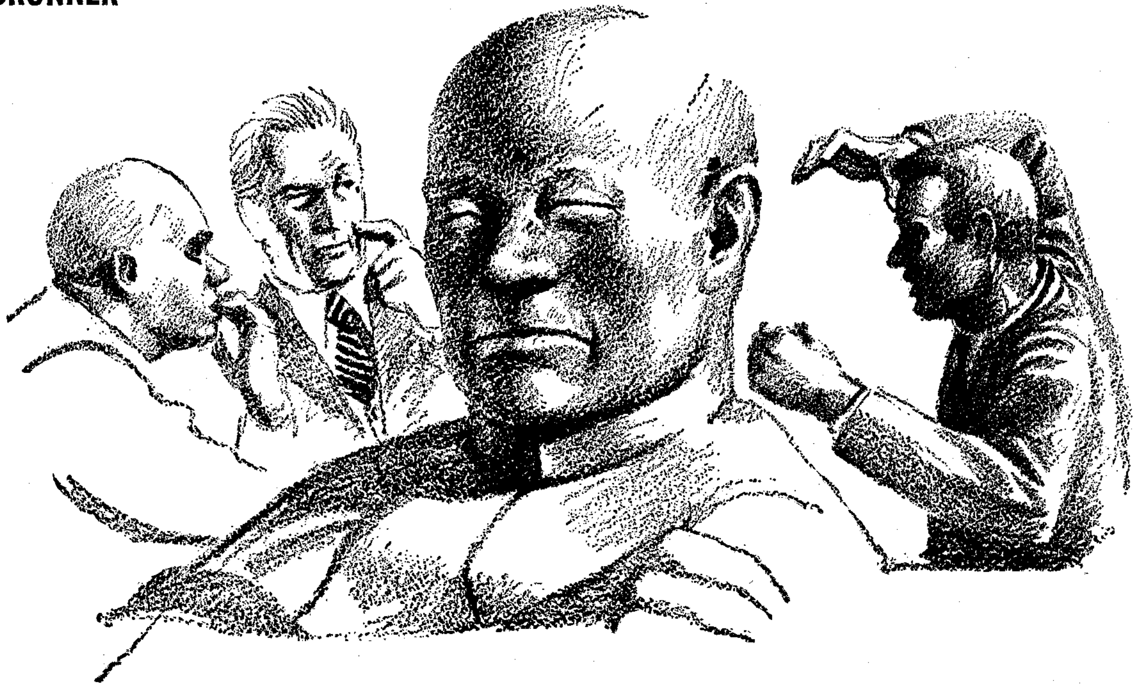
*The authors pay very close attention to your votes; the author who wins first place in the results gets a 1¢ a word bonus, and the second-place author ½¢ a word bonus as earned reward. This means Poul Anderson receives a bonus of $190.00 and The Richmonds $105.00. (THE EDITOR)*

### OCTOBER 1963

| PLACE | STORY | AUTHOR | POINTS |
|---|---|---|---|
| 1. | The Three-Cornered Wheel | *Poul Anderson* | 1.76 |
| 2. | Where I Wasn't Going (Pt. 1) | *Walt and Leigh Richmond* | 2.47 |
| 3. | A World By the Tale | *Seaton McKettrig* | 2.70 |
| 4. | War Games | *Christopher Anvil* | 3.05 |

# SEE WHAT I MEAN!

### JOHN BRUNNER



Ideological disputes are, God knows, hard enough to resolve. But there are even more fundamental differences that can drive men to absolute refusal of co-operation . . .

Illustrated by John Schoenherr

Morning, Geneva, Switzerland. Warm bright sunlight. The famous *jet d'eau* tossing jeweled drops at its own reflection in the calm lake. It was such a beautiful morning, indeed, that Dr. Gerhard Hirnmann had been tempted into leaving home earlier than usual to walk to the hospital.

But on the way he bought a paper to see how the conference was going, and by the time he had read about it his day had been ruined.

He passed the handsome white building where the negotiators were meeting, and a surge of despair made him shake the rolled paper towards the blank windows. Four men on whom the future of the world depended, and they couldn't even agree that a fine sunny morning like this was worth all their points of principle put together.

"What can they be *thinking* of?" he asked the air.

And that was when the idea came to him.

Morning, Geneva, Switzerland. In the cool high-ceilinged room the four delegates to the Foreign Ministers' Conference on the Resolution of Outstanding International Differences and Disarmament assembled—by pairs, through opposite doors. The American and British delegates entered on one side, looking respectively grim and resigned. The Russian and Chinese delegates entered on the other, looking respectively resigned and grim.

They took their places at the table. Yesterday the British Foreign Minister had been the chairman, and the greater part of the proceedings had consisted of an address by the American Secretary of State, who had depicted in the most harrowing terms the probable consequences of a nuclear war and called on the other side to join in efforts to avoid this. The Russian delegate had replied briefly to the effect that he was perfectly aware of all that already thank you, and his colleague would make a full reply the following day.

Now it was the turn of the Russian to take the chair and the Chinese was due to speak. In rather good English his interpreter explained to the other side exactly what China could not agree to—diminution of national integrity, foregoing of outstanding territorial claims, compromise on matters of indisputable importance . . .

It went on for a long time. The Secretary of State did well to resist the impulse to yawn for three solid hours. When he eventually yielded, the Chinese glared at him and launched into an improvised addition to his speech, thus ensuring he would last out the day.

The British Foreign Minister exchanged a covert glance with the Russian chairman. The Russian shrugged, as much as to say, "I've tried to make him see sense!"

It was like butting your head on a brick wall, the Foreign Minister thought. This Chinese fellow had some real arguments on his side—nobody was denying that. If only he'd try to see the other side of them, and admit that the Americans might have some points in their favor, too . . .

Not listening very closely to what his colleague was saying, the Russian in the chair wondered how much longer this was going to go on. You couldn't help agreeing with what the American kept saying about the danger of war—in fact, he described it so vividly you could almost see the calamity happening in front of you. But why, why, *why* couldn't he recognize that points of principle were all-important to the Chinese opposite him, and arrive at a formula which would save him and his country from losing face?

The ninety-third day of the conference wound to its close. It was a measure of the sheer desperation felt by all parties to the negotiations that they were willing to mortgage their most senior diplomats—their Foreign Ministers—to the interminable discussion. But it really seemed as though the entire world had given up hope of reaching a rational settlement, and had decided that the only chance was to drag out the talks as long as possible before they broke down and the planet blew up. This conference was built on the wreck of umpteen other conferences between officials of junior rank, and the only other reason it had gone on so long was that neither side fancied starting a Summit Meeting if there was a risk of it trailing on and on as this meeting had. You could manage without Foreign Ministers, but you couldn't very well park your Chief Executives in another country for an indefinite period.

When the session closed, one by one the big black cars pulled up at the main door: a Caddy for the Secretary of State, a Rolls-Royce for the British Foreign Minister, a Zis for the Russian and a Flaming Dragon for the Chinese. The Flaming Dragon looked very much like the last Buick model but one, but it was Chinese-built from tires to roof.

The first three roared away, up the drive and out on to the highway, and the Flaming Dragon set out to follow—

—Only to find itself rammed broadside by a large Mercedes driven by a small gray-haired man in a dark suit and silver-rimmed glasses.

The chauffeur leaped out, drawing an automatic. The interpreter leaped out, drawing a rubber truncheon. The Chinese Foreign Minister sat tight, wary of a possible attempt to kidnap him.

"What do you think *you're* playing at?" the interpreter said in fluent French to the little man with gray hair, who was wringing his hands and explaining how sorry he was.

"I had no *idea!*" the little man said. "What a stupid and careless thing to do! Why, it's the Chinese delegate to the conference in that car, isn't it?"

The interpreter debated whether to deny the fact, remembered that a large number of capitalist journalists had taken pictures of his boss, and shrugged, which seemed a fair compromise between admitting and denying it.

"Oh, I hope he isn't hurt by the accident!" wailed the gray-haired man. "Look, I am Dr. Gerhard Hirnmann, and I work at the hospital up the road which is the finest and most advanced in Europe for the curing of damage to the nervous system. You must let me examine the Minister and see if he is injured. Why, even shock might have an effect on the outcome of this important conference!"

Satisfied at last that the accident wasn't faked, the prelude to a raid—he had done such things himself in the old days at home, when he was a member of a guerrilla band hunting in the hills—the Foreign Minister leaned out of the car and demanded to know what the man with gray hair wanted.

The interpeter told him. The Minister considered for a moment. The interpreter, who—thanks to his elevated position close to the high officials of government—had long ago decided that *he* never wanted to see a war in which a hundred million Chinese joined their ancestors, thought of the point which Dr. Hirnmann had made about shock to the Minister upsetting the conference, and added several excellent and eloquent pleas of his own.

The Foreign Minister scowled. However, the interpreter was usually trustworthy, and he had managed to get across a subtle warning about the danger of losing face in public if the accident had disturbed the Minister's mental functions, which weighed very strongly.

He consented to accompany Dr. Hirnmann to the hospital for a brief examination, and the following day the papers didn't say a word about it. The Chinese delegation weren't interested in publicity.

The ninety-fourth day of the Conference on the Resolution of Outstanding—et cetera—wound to its weary close. The United States Secretary of State had the chair today, and most of the proceedings consisted in a fierce argument between the chair and the Chinese delegation. Twice the American looked daggers at the British delegate because he conceded a point to the Chinese and the Russian; three times the Chinese hissed unprintable insults at the Russian for appearing to give ground to the capitalists. It was deadlock again. But at least today was Friday, and with the week end coming the world was assured a war wouldn't break out for two more days.

The British Foreign Minister was looking forward to the private dinner the Russian had invited him to. The Soviet point of view throughout this conference seemed to him more reasonable than usual. Indeed, he was getting on rather well with the Russkies. If only—he sighed here, long and deeply—he could get on as well with his own colleague from the United States.

Once more the cars rolled up, and once more they sped out of the gates: the Flaming Dragon in the lead today, the Rolls, the Zis, and then the Caddy.

And just as it was turning into the main road, the Caddy was rammed by a Mercedes driven by a small man with gray hair and silver-rimmed glasses.

The Secretary of State had heard about the hospital up the road where Dr. Hirnmann worked. It was famous all over the Western world. He had even been considering going there for a checkup, because the strain of the long conference was waking up his old ulcers . . .

"It is madness!" the Russian said. He spoke excellent English. Leaning forward confidentially over the table, he went on, "Let me be frank. After all, what we have been through together at this conference has made us . . . how do you say it? . . . old comrades in arms!" He hiccuped, and chuckled as soon as he could.

The British Foreign Minister winced slightly, reflecting that this Russian custom of drinking innumerable toasts in vodka with no heel taps took a little practice. But he looked politely expectant.

"My Chinese colleague—" the Russian began. He paused, and a scowl bit deep into his face. "Of course, I am not saying he is not politically correct! His Marxist reasoning is impeccable. But . . . oh, let's face it, Mr. Minister! He's a pig-headed fool!"

It must be the vodka, the British Minister told himself owlishly. Because he could distinctly hear himself saying, "You know, sometimes I feel exactly the same thing about our American friend. He's so . . . so dogmatic, isn't he?"

They sighed in unison over the failings of their associates.

Suddenly the door of the dining room was flung open. A harassed-looking young man appeared. Without apologizing, he addressed a flood of fierce Russian to his astonished chief.

"There is a man outside," he translated for his guest's benefit, "who says he can save the world and must see us urgently. He sounds like a madman. I'll have him thrown out."

"No!" said the British Foreign Minister, raising his hand solemnly. There seemed to be more of the hand than usual—twice as much, in fact. "Don't do that. After all, we've spent months in conference and got nowhere. Maybe we need a madman to advise us."

The Russian stared for a moment, then crowed with laughter. "Very good!" he roared. "We will see him. Tell me," he added, turning to his aide, "what's this madman's name?"

"Dr. Gerhard Hirnmann," the aide said stiffly.

Morning, Geneva, Switzerland. A dull gray day with the threat of rain. The citizens hurrying to work were astonished at the sight of a respectably-dressed man with silver-rimmed glasses dancing and singing as he made his way on foot towards a famous hospital on the outskirts of the city, waving a newspaper as though conducting a one-man chorus of celebration. Banner headlines in the paper announced: DEADLOCK BROKEN! PEACE IN SIGHT! CONFERENCE REACHES AGREEMENT!

"Have you heard the wonderful news?" his chief assistant said as Dr. Hirnmann entered the hospital. "How do you suppose it happened?"

Dr. Hirnmann, making a last pirouette, paused and faced his assistant.

"You are aware," he said, "that some people when examined on an electroencephalograph display an absence of alpha rhythms. These are people who think exclusively in visual terms. They are classed 'M' for *minus*—yes? You know that some people display persistent alpha rhythms, and these think exclusively in abstracts, without visual imagery. They are classed 'P' for *persistent.* You know that most people have alpha rhythms which appear when the eyes are closed and disappear again when they start using their faculty of visualization, and that these are classed 'R' for *responsive.* You further know that someone who is 'P' and someone who is 'M' generally can't understand each other's point of view."

The assistant looked blank. He said, "I know all—"

Dr. Hirnmann ignored him. "Now if you can explain to someone who is the ordinary 'R' type that he has to deal with people of types 'P' and 'M', then you can make a link between the parties who disagree because an 'R' person thinks to some extent in each of these modes."

"Yes!" said the assistant. "But what—?"

"Following a motorcar accident the other evening the Chinese delegate to the conference came here for an examination. You'd gone home by then. I studied him with the electroencephalograph. As I suspected, he is a person who thinks in almost pure abstracts; he's concerned about losing face, and about absolute political principles.

"By . . . uh—" Dr. Hirnmann looked modestly at his shoes. "By a strange coincidence the American delegate also had an accident, and also came for examination. You'd gone home again. It turns out that he thinks exclusively in pictures. He can visualize something so perfectly that he can describe it as though it were there in front of him. Neither of them is to blame, of course—it's an accident of heredity.

"Luckily for us, and the world, the British and Russian delegates proved to be of the intermediate 'R' type and saw what I was driving at."

"What you were driving at?" the assistant echoed.

"Exactly," said Dr. Hirnmann with satisfaction. "What's more, though I'm an extremely bad driver, I hit it twice." He felt in his pocket and produced a piece of paper. "Kindly do something for me. Divide the total of this bill in half and send requests for payment to the Chinese and American governments. Call it a fee for medical examination, naturally."

He deposited the paper in the hands of his startled assistant and went whistling away down the corridor. After some time, the assistant recovered sufficiently to look at what he had been given.

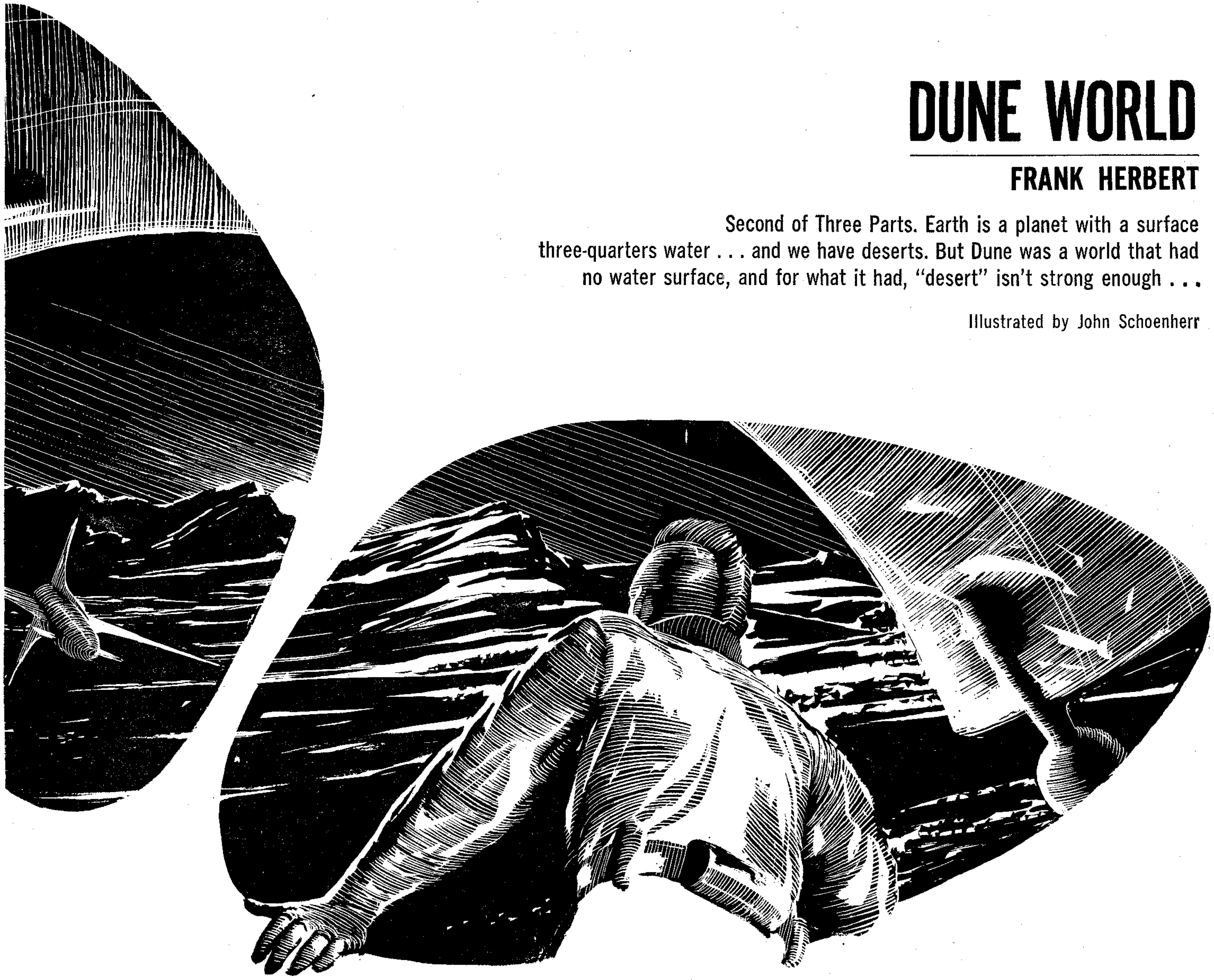
It was a bill from a car-hire company for extensive damage to the front of a Mercedes. ■

# DUNE WORLD

## FRANK HERBERT

Second of Three Parts. Earth is a planet with a surface three-quarters water . . . and we have deserts. But Dune was a world that had no water surface, and for what it had, "desert" isn't strong enough . . .

Illustrated by John Schoenherr



*In the seventy-second year of the Padishah Emperor Shaddam IV, the House of Atreides was forced out of its lush and water-rich planet of Caladan, and was sent to rule the desert planet of Arrakis (Dune), the only known source in the universe of the costly geriatric spice, melange. Some interpret this as a victory over the Atreides' ancient enemies, the Harkonnens, who had ruled Arrakis, but the Atreides suspect a trap. Aside from the spice, which is mined from sands guarded by gigantic worms and bands of Fremen, the desert folk who live outside the Arrakeen labor pool, Arrakis is a hell planet.*

*The Atreides, led by the Duke Leto, include his son, Paul, age fifteen, and Paul's mother, the concubine Lady Jessica, a product of the mysterious Bene Gesserit Schools.*

*Before the family leaves Caladan, Paul is subjected to the* gom jabbar *ordeal of pain by the Reverend Mother Gaius Helen Mohiam, a Bene Gesserit Proctor and the Emperor's Truthsayer. She concedes that Paul has latent abilities as a Mentat, a human computer, and may even be the long hoped for* Kwisatz Haderach, *"the one who can be many places at once." This is a human male for whom Bene Gesserits have been selectively breeding over a period of many centuries. The Reverend Mother is shaken by Paul's obviously prescient dreams and his Truthsay ability, but she warns of a black future for all of the Atreides House—particularly for the Duke Leto.*

*Paul is being trained in the Bene Gesserit Way of mind and body control by his mother, learning to use even his Voice as a weapon. Training in statecraft is directed by his father; in intrigue by his father's Mentat Master of Assassins, Thufir Hawat; in the craft of fighting with blades and force-field shields by the swordmaster, Duncan Idaho, and the troubadour-warrior, Gurney Halleck. Guiding the boy's training in the liberal arts is Dr. Wellington Yueh, a traitor in the pay of the Harkonnens, whose strange motives have led him to give Paul an Orange Catholic Bible. The gift feeds Paul's sense of Terrible Purpose.*

*Plotting against the Atreides is the Baron Vladimir Harkonnen, a wily and grossly fat old man, who is a controlling force in the CHOAM Company (Combine Honnete Ober Advancer Mercantiles), the firm which monopolizes distribution and sale of melange. The Baron is assisted by his young nephew, Feyd-Rautha, and by his Mentat-Assassin, Piter de Vries, a man addicted to mel-*

*ange. Piter's addiction is marked by a physical characteristic common to Arrakis—the blue eyes—his entire eye surface having become impregnated by transparent blue pigment.*

*The Harkonnens have set Arrakis as a trap to catch the Duke and destroy him. Part of their plot involves turning suspicion on the Lady Jessica, and part requires use of the Padishah Emperor's dread soldier-fanatics, the Sardaukar.*

*The Atreides, forced to obey their Emperor's command, move to Arrakis on a Guild Heighliner, a ship of the mysterious organization which controls space travel and interplanetary banking.*

*On Arrakis, the Lady Jessica finds evidence that the* Missionaria Protectiva *of her order has secretly planted legends among the Fremen, legends to aid Bene Gesserits trapped on the planet. Her new housekeeper, a Fremen woman called the Shadout ("Well Dipper") Mapes, reveals the religious groundwork in the act of giving Jessica a Fremen crysknife. The gift of the weapon is a mark of recognition with profound undertones.*

*Meanwhile, Paul is napping in a room of their new residence, a room that seems designed to attract a teenage boy. As he gets up to explore the residence, he is confronted by an assassination weapon planted there: a hunter-seeker. It's a ravening sliver of metal guided remotely by some nearby human eye and hand, and it can burrow into any moving thing of soft flesh, following nerve channels to the nearest vital organ.*

## PART 2

But the hunter-seeker had its limitations. The compressed suspensor field on which it moved distorted the vision of its transmitter eye. With nothing but the dim light of this room to reflect his target, the operator would be relying on motion—anything that moved. A shield could slow a seeker, giving time to destroy it, but Paul had put aside his shield on the bed. The belt had been uncomfortable beneath his back. Some prime targets for assassins even carried lasguns to knock down seekers, but lasguns were expensive and notoriously cranky of maintenance, and there was always the danger of explosive pyrotechnics with them if the laser beam intersected a hot shield. The Atreides had always relied on their body shields and their wits. Now, Paul had only his wits to meet this threat. He held himself in near catatonic immobility.

The seeker lifted, swung sideways across the room and back. It rippled through the slatted light from the windowblinds, back and forth, quartering.

*I must try to grab it,* Paul thought. *The suspensor field will make it slippery on the bottom, but if I grip tightly . . .*

The hall door behind Paul opened. The seeker arrowed past his head toward the motion. Paul's reaction was a flashing reflex. His right hand shot out and down, gripping the deadly thing. It hummed and twisted in his hand, but his muscles were locked on it in desperation. With a violent turn and thrust, he slammed the seeker's nose against the metal doorplate. He felt the crunch of it as the nose eye smashed and the seeker went dead in his hand, but still he held it . . . to be certain.

Paul's eyes came up, met the open stare of total blue from the Shadout Mapes.

"Your father has sent for you," she said. "There are men in the hall to escort you some place."

Paul nodded, his eyes and awareness focusing on this odd woman in a sacklike dress of bondsman brown. She was looking now at the thing in his hand.

"I've heard of suchlike," she said. "It would've killed me, not so?"

He had to swallow before he could speak. "I . . . was its target."

"But it was coming for me."

"Because you were moving." And he wondered: *Who is this creature?*

"And you saved my life then," she said.

"I saved both our lives."

"Seems like you could've let it have me and made your own escape," she said.

He scowled, thinking: *Those will be Hawat's men she speaks of. We must find the operator of this thing.*

"Get those men you say came for me," he ordered. "Tell them I've caught a hunter-seeker in the house and they're to spread out and find the operator. They'll know how to go about it. Sure to be a stranger among us." He focused on the woman. "Who are you?"

"The Shadout Mapes, new to the servantry here."

"How did you know where to find me?"

'Your mother told me. I encountered her at the stairs to that weirding room down the hall." She pointed to her right. "Before I do your bidding, manling, it's well I say this. You've put a burden on me I'm not sure I care to support, but we Fremen always pay our debts, be they black debts or white debts. And it's known to us that you've a traitor in your midst. Who it is we cannot say, but we're certain sure of it."

Paul absorbed this—*weirding room . . . traitor.* Before he could speak, though, the odd woman whirled away and ran back toward the entry and the great hall.

He thought to call her back, but there was that about her which told him she'd do his *bidding.* The place would be swarming with Hawat's men soon. His mind picked out another part of her strange conversation: *we Fremen.* So that was a Fremen. He paused to go through the mnemonic blink that would store the pattern of her face in his mind—prune-wrinkled features darkly browned, and those blue-on-blue eyes without any white to them. He attached the label in his memory: *The Shadout Mapes.*

Still holding the shattered seeker, Paul turned back into his room, scooped his shieldbelt from the bed lefthanded and swung it around his waist, buckling it as he ran out of the place. She'd said his mother was some place to the left—stairs, a *weirding room.*

## X

*What had the Lady Jessica to sustain her in her time of trial? Think you carefully on this Bene Gesserit proverb and perhaps you will see: "Any road followed precisely to its end leads precisely nowhere. You must climb a mountain just a little bit, enough to test that it's a mountain. From the top of the mountain, you cannot see the mountain. And what is beyond is the same as what is here. Let your senses tell you only reality."*

*"Muad'Dib: Family Commentaries"*
*by The Princess Irulan*

At the end of the south wing, Jessica found a metal stairway spiraling up to an oval door. She glanced back down the hall, again up at the door.

*Oval,* she thought. *What an odd shape for a door in a house.*

Through the windows beneath the spiral stair she could see the great white sun of Arrakis moving on toward evening. Long shadows stabbed down the hall. She returned her attention to the stair. Harsh side-lighting picked out bits of dried earth on the open metalwork of the winding steps.

Jessica put a hand on the stair rail, began to climb. The rail felt cold under her sliding palm. She stopped at the door. There was no handle, but there was a faint depression on the door's surface where a handle should have been.

*Surely not a palm lock,* she told herself. *A palm lock has to be keyed to one individual's hand shape and palm lines.*

But there were ways to open any palm lock—as she had learned at the Bene Gesserit school. She glanced back to make certain she was unobserved, placed her palm against the depression in the door. The most gentle of pressures to distort the lines—a turn of the wrist, another turn, a slidding twist of the palm across the surface.

She felt the click.

But there were hurrying footsteps in the hall behind. Jessica lifted her hand away from the door, turned, saw Mapes come to the foot of the stairs.

"There are men in the great hall say they've been sent by the Duke to get the young master Paul," Mapes said. She glanced at the oval door, back to Jessica.

"He's in that fifth room from the end, the small bedroom," Jessica said. "If you have trouble awakening the boy, call on Dr. Yueh in the adjoining room. Paul may require a wakeshot."

Again, Mapes shot a look at the oval door, and Jessica detected a deep emotion in the woman's face—quite possibly loathing. Before Jessica could ask about the door and what it hid, Mapes had turned and was hurrying back down the hall.

*Hawat's men certified this place,* Jessica thought. *There certainly cannot be anything too terrible in here.*

She pushed the door. It swung inward onto a small room with another oval door opposite. The other door had a wheel handle.

*An air lock!* Jessica told herself. She glanced down, saw a door prop fallen to the floor of the little room. The prop carried Hawat's personal mark. *The place was left open,* she thought. *The door was propped open and someone probably knocked the prop down accidentally, not realizing the outer door would close itself on a palm lock.*

Jessica stepped into the little room.

*But why would someone build an air lock into a fixed structure such as a house, a place that would never see the emptiness of space?* she asked herself. She thought suddenly of exotic creatures sealed off in their special climates.

*Special climate!*

The door behind her began swinging itself closed. She caught it and propped it securely open with the stick Hawat had left. Again, she faced the wheel-locked inner door, and saw faint writing etched into the metal above the handle. It was written in Galach:

"O, Man! Here is a lovely portion of God's Creation; then, stand before it and learn to love the perfection of Thy Supreme Friend."

Jessica touched the wheel, turned it to the left, pushed the inner door open. A gentle draft feathered her cheek, stirred her hair. She felt the change in the air. It tasted richer. She swung the door wide, looked through the oval opening into masses of greenery with yellow sunlight pouring across it.

*A yellow sun?* she asked herself. Then: *Filter glass!*

She stepped over the sill and the door swung itself closed behind her.

"A conservatory," she breathed. "A wet-planet conservatory!"

Potted plants and low-pruned trees stood all about her. She recognized a mimosa, a flowering quince, a sondagi, green-blossomed pleniscenta, red and white striped akarso . . . roses . . .

*Even roses!*

She bent to breathe the fragrance of a giant pink blossom, then straightened to peer around the room.

A rhythmic noise invaded her senses.

She parted a jungle overlapping of leaves, looked through to the center of the room. A low fountain stood there, small with fluted lips. The rhythmic noise was a peeling, spooling arc of water falling thud-a-gallop onto the metal bowl.

Jessica sent herself through the quick sense-clearing regimen, began a methodical inspection of the room's perimeter. It appeared to be about ten meters square. From its position above the end of the hall and from subtle differences in the construction, she knew it had been added onto the roof of this wing long after the original building had been completed.

She stopped at the south limit of the room in front of the wide reach of filter glass, stared around her. Every available space in the room was crowded with exotic wet-climate plants. Something rustled in the greenery. She tensed, then glimpsed a servo-arm, one of the simple clock-set type. It lifted, sent up a fine spray of dampness that misted her cheeks, then retracted. She looked at the plant it had watered: a fern tree.

Water everywhere in this room—on a planet where water was the most precious juice of life. Water being wasted so conspicuously that it shocked her.

She glanced out at the filter-yellowed sun. It hung low on a jagged horizon above the cliffs that were part of the immense uplifting of rock known as the Shield Wall.

*Filter glass*, she thought. *To turn the white sun of Arrakis into something softer and more familiar. But who could have ordered the building of such a place? Leto? It would be like him to surprise me with such a gift, but there hasn't been time. And he's been busy with other problems.*

She recalled the report that many Arrakeen houses were sealed by air-lock doors and windows to conserve and reclaim the airborne moisture within. And Leto had told her that it was a deliberate statement of power and wealth for this house to ignore such procedures, its door and window seals being designed to exclude only the omnipresent dust.

But this room embodied a statement far more significant than the lack of waterseals on the doors to the exterior world. This pleasure room, she estimated, used water enough to support a thousand persons—possibly more.

Jessica moved along the window, still looking into the room. The change of position brought into view a metallic surface at table height beside the central fountain and, on that surface, a white notepad and stylus partly concealed by an overhanging fan leaf. She crossed to the table, noted one of Hawat's daysigns on it, studied a message written on the pad:

"To the Lady Jessica: May this place give you as much pleasure as it has given me. Please permit this room to convey a lesson that we learned from the same teachers: the proximity of a desirable thing may tempt one to overindulgence. On that path lies danger. My kindest wishes, Margot Lady Fenring."

*Fenring?* Jessica asked herself, then nodded remembering that Leto had referred to the Emperor's former proxy here as Count Fenring. But it was the hidden message of the note that demanded her attention, couched as it was in a way to tell her that the writer was another Bene Gesserit. And a bitter thought touched Jessica's mind in passing: *The Count married his Lady.*

Even as this thought flicked through her mind, she bent to seek out the hidden message. It had to be there because the visible note contained the code phrase, the claxon warning that every Bene Gesserit not bound by a School Injunction was duty-called to give to another Bene Gesserit: *"On that path lies danger."*

Jessica felt the back of the note, rubbing the surface for special coded dots. None. The edge of the pad came under her seeking fingers. Nothing. She put the pad back where she had found it. *Something in the position of the pad?* she wondered. But Hawat had probably moved it in checking the room. She looked at the leaf above the pad. The leaf! She brushed a finger along the under surface of it and, along the stem, found the subtle coded dots she had been seeking. She scanned them with the passage of her hand:

"Your son and your Duke are in immediate danger. A bedroom has been made to attract your son and the H have loaded it with deathtraps to be discovered, but leaving one trap that may escape detection." Jessica silenced the urge to run back to Paul. The full message had to be learned. Her fingers sped over the dots. "I do not know the exact nature of the room's menace, but it has something to do with the headboard of a bed. As to your Duke, the threat involves the defection of a trusted companion or lieutenant. There is also something involving the use or the harvesting of the spice. The H plan for you is to give you as payment to a minion. To the best of my knowledge, this room is safe. Forgive that I cannot tell more, but my sources are few as my Count is not in the pay of the H. In haste, MF."

Jessica thrust the leaf aside, whirled to dash back to Paul, and in that instant the oval air-lock door slammed open across the room from her. Paul jumped through, holding something in his right hand, slammed the door behind him. He pushed his way through the leaves to her, glanced at the fountain, thrust his hand and the thing it clutched under the falling water.

She grabbed his shoulder, stared at the hand. "What is that?"

He spoke casually, but she recognized that effort behind his words. "A hunter-seeker. Caught it in my room and smashed the nose of it, but I want to be sure. Water should short it out completely."

"Immerse it!" she commanded. "Drop it!"

He obeyed, shook water from his hand as they continued to stare at the shattered metal object in the fountain. It lay quiescent, dead.

Jessica broke off a plant stem, prodded the seeker, peering into the broken end. Yes, it was destroyed. She dropped the plant stem into the fountain, looked at Paul. His eyes were opened wide and he was studying the room with a searching intensity that she recognized—the BG Way.

"Anything could be hidden in here," he said.

"I've good reason to believe it's safe here," she said.

"My room was supposed to be safe, too. Hawat . . ."

"It was a hunter-seeker," she reminded him. "That means someone in the house to operate it. The thing could have been installed after Hawat's investigation."

But she thought of the message on that leaf: "*. . . defection of a trusted companion or lieutenant.*" *Not Hawat, surely. Oh, surely not Hawat.*

"Hawat's men are searching the house now," he said.

"That seeker almost got some old woman who came to wake me."

"The Shadout Mapes," Jessica said, remembering the encounter at the stairs. "The message summoning you to your father . . ."

"That can wait," Paul said. "Why do you think this room's safe?"

She pointed to the note. "There's a message in this from another Bene Gesserit."

"You trust it?"

"Yes."

But Jessica remained inwardly tense, thinking: *A hunter-seeker! O, Merciful Mother!* It took all of her training to keep down a hysterical fit of trembling that she could feel just at the edge of awareness.

Paul spoke matter of factly: "It's the Harkonnens, of course. This is too much. We shall have to destroy them."

His words restored a measure of calmness to her, and she thought: *He speaks like a man. His father all over again in a time of crisis action.*

A rapping sounded at the air-lock door—the code knock of one of Hawat's corps.

"Come in," Paul called.

The door swung wide and a man in Atreides uniform with the Hawat insignia at his cap leaned into the room. "There you are, sir," he said. "The old woman said you'd be here. We found a cairn into the cellar and caught a man trying to flee through it. He had a seeker console."

"Who was it?" Paul asked.

"No one we know, sir."

"Take him some place where we can interrogate him," Jessica said.

"Sorry, My Lady," the man said. "We messed him up too much catching him. He died."

"Nothing on him to identify him?" she asked.

"No, My Lady."

"Was he a native or someone the Harkonnens left behind?" Paul asked.

"He has the native look," the man said. "And he'd been in this cairn for a goodly time, put into it from the outside and left there to await our coming. The stone and mortar where he came through into the cellar were untouched when we inspected the place before. I'll stake my reputation on it."

"No one questions your thoroughness," Jessica said.

"Thank you, My Lady."

"We would like to be certain there are no more of these little surprises left behind, however. Please send a message to the Duke that you'll be delayed and go over the house walls once more with sonic echo equipment."

"We're already doing that, My Lady. And it's Hawat's orders that under such circumstances we sequester the young master in a safe place." He glanced around the room. "What of this place?"

"Hawat himself checked it," Jessica said, "and I've other reasons to believe it secure."

"Then I'll mount guard outside here, My Lady, until we've been over the house once more." He bowed, backed out the door which swung closed behind him.

In the silence that followed, Paul again studied the room with that sensitive alertness. Presently, he said: "There's a palm lock on the door. I saw it as I came through there."

"No doubt it was set to insure privacy for the Bene Gesserit Lady who lived here before us," Jessica said. "We like to have a quiet place for retreat; it soothes and restores us."

"Will you have the lock changed to your palm?"

"I may change it, but I can open any palm lock."

He studied her face, then: "You said that for a special purpose."

"Not many know it can be done simply and speedily," she said. "It's a thing I'll teach you that you must not use openly nor let others know you can do."

"I see." He nodded. "Had we better go over the house now ourselves? Your eyes see things others might miss."

"I've already been over most of the house," she said. "This wing was the only place I'd not studied carefully. I was putting it off because . . ."

"Because Hawat gave this wing his personal attention."

She stared at him.

"I trust Hawat," she said. "And you can depend on it that this wing will be made secure now. A stray insect won't be able to wander in here. Hawat will be shamed that . . ."

"I wasn't questioning Hawat," he said.

"Then what are you doing?"

"I was suggesting that Hawat is getting old . . . he's overworked. We might be able to take some of the load from him."

"It would only shame him and impair his effectiveness," she said. "Hawat has prepared his own replacement should he ever falter. One of his corps. Your father will know who he is."

"You know who it is, too," he said.

She smiled, remained silent.

"I see," Paul said. "Hawat must tell me himself . . . should he so choose."

*So perceptive,* she thought. And she focused her mind anew on Hawat. *Could he be the one . . . the traitor? Impossible!*

Paul said: "When my father is bothered by something you've done, he says *Bene Gesserit!* like a swear word."

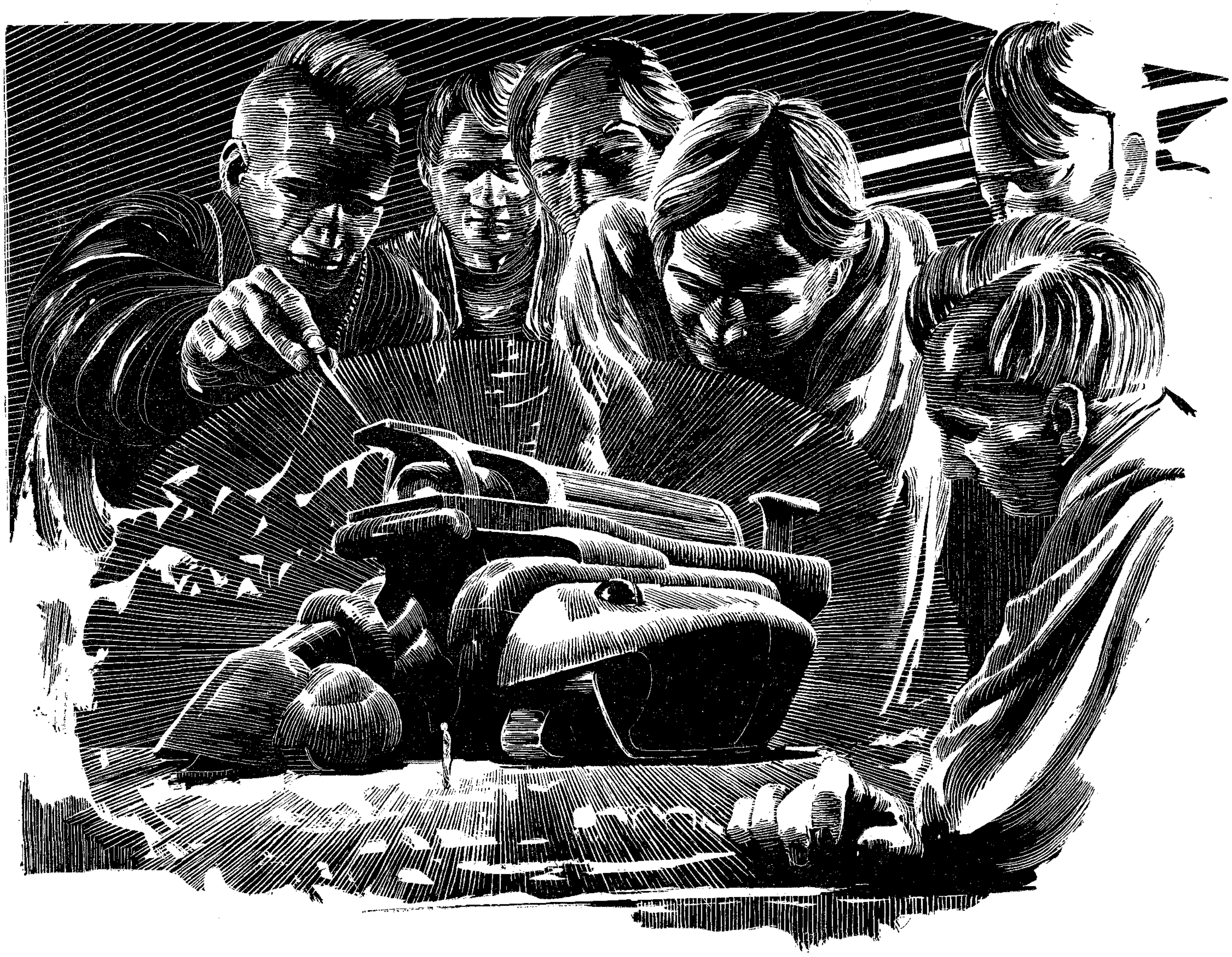
"And what is it about me that bothers your father?"

"When you thwart him. I've heard him call you a Bene Gesserit witch."

She concealed the silent laughter which shook her.

Paul's face remained sturdily somber. "Why will you not talk to me about Hawat?"

"He has served three generations of Atreides with honor," she said. "He deserves every respect we can pay him . . . many times over."



"Now I know how my father feels about you sometimes," he said.

She suppressed the feeling of wry humor, said: "Why is it so important to talk about Hawat?"

And Paul thought: *It will worry her, but I must tell her what the old Fremen woman said about a traitor among us.*

Paul shrugged, recounted his exchange with the Shadout Mapes.

Jessica thought of the message on the leaf: "*. . . a trusted lieutenant.*"

She showed him the leaf and its message, told him what it said.

"We must tell my father at once," he said. "He'll wring the truth out of that Fremen woman."

"I think she told you all the truth," Jessica said.

He thought about this, said: "Yes. She spoke the truth. But that means we must take special precautions. We can trust no one."

"There's another possibility," she said.

"Oh?"

"That this message was meant to get back to us . . . that the people carrying it believed it true, but the only purpose was to get this message to us."

He pursed his lips, then: "To show distrust and suspicion in our ranks . . . to weaken us in that way. I see."

"You must tell your father, but privately and cautioning him of this aspect in it," she said.

"Yes, of course."

She put an arm around his shoulder, turned to the tall reach of filter glass facing southwest. Out there, the sun of Arrakis was moving well on toward sunset, a yellowed ball low over the cliffs.

Paul glanced at his mother, said: "I don't think it's Hawat either. Could it be Dr. Yueh?"

"He's not a lieutenant," she said. "And I can assure you he hates the Harkonnens as bitterly as we do."

He directed his attention where his mother was looking—out toward the cliffs. *And it couldn't be Gurney . . . or Duncan,* he thought.

Paul stared at the landscape, thinking.

Jessica, with her attention on the same scene, studied it. Beyond the ducal grounds she saw a high-fenced storage yard—lines of spice silos within it, and with stilt-legged watch towers spaced along the edges like so many startled spiders. She noted the basic design for the spice silo: about twenty meters in diameter and thirty-five or so meters tall. She could see at least twenty storage yards of them reaching out to the cliffs of the shield wall—all tokens of wealth—silos repeated, stuttering across the flats.

Slowly, the filter-yellowed sun buried itself beneath the horizon. Stars leaped out. She saw one bright star so low on the horizon that it twinkled with a clear, precise rhythm—a trembling of light—blink-blink-blink-blink-blink . . .

Paul stirred beneath her arm.

But Jessica concentrated on that star, realizing that it was *too* low, that it must come from the Shield Wall cliffs. Her arm tightened on Paul's shoulder.

*Someone signaling!*

She tried to read the message, but it was in no code she had ever learned.

Other lights had come on down on the plain beneath the cliffs—little yellows spaced out against blue darkness. And one light off to their left grew brighter, began to wink back at the cliff—very fast; blinksquirt, glimmer, blink. And it was gone.

The false star winked out immediately.

Signals . . . and they filled her with premonition.

*Why were lights used to signal this basin?* she wondered. *Why couldn't they talk over the regular communications network?*

The answer was obvious: the communinet was certain to be tapped now by agents of the Duke Leto. Light signals could only mean that messages were being sent between his enemies . . . between Harkonnen agents.

There came a tapping at the door behind them, and the voice of Hawat's man intruded: "All clear, sir. Time to be getting to your father."

## XI

*It is said that the Duke Leto blinded himself to the perils of Arrakis, that he walked heedlessly into the pit. Would it not be more likely to suggest he had lived so long in the presence of extreme danger that a change in the intensity of it escaped him? Or is it possible he deliberately sacrificed himself that his son might find a better life? All the evidence indicates that the Duke was not a man easily hoodwinked.*

"Muad'Dib: Family Commentaries"
by The Princess Irulan

The Duke Leto Atreides leaned against a parapet of the landing control tower outside Arrakeen. The night's first moon, an oblate silver coin, hung well above the southern horizon. Beneath it, the jagged cliffs of the "Shield Wall" shone like parched icing through a dust haze. To his left, the lights of Arrakeen glowed through the haze . . . yellow . . . white . . . blue . . .

He thought of the notices posted above his signature all through the populous places of this planet: "Our sublime Padishah Emperor has charged me to take possession of this planet and end all dispute."

The ritualistic formality of it touched him with a sense of loneliness. Who was fooled by that fatuous legalism? Not the Fremen, certainly. Nor the Houses Minor who controlled the interior trade of Arrakis . . . and were Harkonnen creatures almost to a man.

Lights of a moving vehicle could be seen coming toward the landing field from Arrakeen. That would be the guard and troop-carrier bringing Paul, he hoped. He did not like the delay in their return, but he had charged the lieutenant to take every precaution. Better a cautious delay than . . . He shook his head to drive out morbid thoughts, glanced back at the field where five of his own frigates were posted around the rim like monolithic sentries.

*"Our Sublime Padishah Emperor . . ."*

If the people of this drowsy, decadent garrison town could only see the Emperor's private note to "his" Duke, the disdainful comments about veiled men and women: ". . . But what else could you expect of barbarians whose major dream is to live outside the faufreluches?"

At this moment, the Duke felt that his own dream was to end all class distinctions and never again think of the rigid stratifying of the faufreluches.

He looked up and out of the dust at the unwinking stars, thought: *Around one of those little lights circles Caladan. But I'll never see my home again.* The longing for Caladan was a pain in his breast, and he felt that it did not come from within himself, but that it reached out to him from Caladan. He could not bring himself to call this dry wasteland of Arrakis his home, and he doubted that he ever would. *I must mask my feelings,* he thought. *For the boy's sake. If ever he's to have a home, this must be it. I may think of Arrakis as a hell I've reached before death, but he must find that which is admirable here. There must be something.*

A wave of self pity, immediately despised and rejected, passed through him, and for some reason he found himself recalling two lines from that poem Gurney Halleck repeated so often:

*"My lungs taste the air of time*
*"Blown past falling sands . . ."*

Well, Gurney would find plenty of falling sands here, he thought. The central wastes beyond those moon-frosted cliffs were desert—barren rock, dunes and blowing dust, an uncharted dry wilderness with here and there along its rim and scattered through it, knots of people: the Fremen. If anything could buy a future for the Atreides line, those Fremen just might do it. Fighting men hardened by the rigors of this planet were a far more important wealth than the spice could ever be.

Provided the Harkonnens had not managed to infect the Fremen, too, with their poisonous schemes.

A scrapping metal racket vibrated through the tower and shook the parapet beneath his arms. Blast shutters dropped in front of him, blocking the view.

*Shuttle's coming,* he thought. *Time to get started. Time to find out just how bad this situation really is.* He turned to the stairs behind him, headed down to the big waiting room.

The men already were boiling in from the field when he reached the yellow-domed room. They carried their spacebags over their shoulders, shouting and roistering like students returning from vacation.

"Hey! Feel that under your dogs? That's gravity!" "How many gees does this place pull? It feels heavy." "Nine-tenths of a gee by the book."

The crossfire of thrown words filled the room.

"Did you get a good look at this hell hole on the way down? Where's all the loot this place's supposed to have?" "The Harkonnens took it with 'em!" "Me for a hot shower and a soft bed!" "Haven't you heard, stupid? No showers here." "Can it! The Duke!"

The Duke suppressed a smile as he stepped out into the now-silent room.

Gurney Halleck strode along at the point of the crowd, bag over one shoulder, the neck of his nine-stringed *baliset* clutched in the other hand. They were long-fingered hands with big thumbs, full of the tiny movements that drew delicate music from the *baliset.*

The Duke watched Halleck, admiring the rolling, ugly lump of a man, noting the glass-splinter eyes with their gleam of savage understanding. Here was a man who lived outside the faufreluches while obeying every precept of them. What was it Paul had called him? *Gurney, the valorous!*

Halleck's wispy blond hair trailed across barren spots on his head. His wide mouth was twisted into a pleasant sneer, and the sable scar of the inkvine whip slashed across his jawline. His whole air was of casual, shoulder-set capability. He came up to the Duke, bowed.

"Gurney," Leto said.

"My Lord." He gestured with the *baliset* toward the men in the room. "This is the last of them. I'd have preferred coming in with the first wave, but . . ."

"I know, Gurney." The Duke glanced left. "Step aside with me, Gurney, where we may talk."

"Yours to command, My Lord."

They moved into an alcove with a coin-slot water machine while the men stirred about restlessly in the big room.

Halleck dropped his bag into a corner, kept his grip on the *baliset.*

"How many men can you let Hawat have?" the Duke asked.

"Is Thufir in trouble, sire?"

"He's lost only two agents, but his advance men gave us an excellent line on the Harkonnen setup here in Arrakeen. If we move fast we may gain a measure of security here, the breathing room we require. He wants as many men as you can spare—men who won't balk at a little knife work."

*"They shall come all for violence: their faces shall sup up as the east wind, and they shall gather the captivity of the sand,"* Halleck quoted.

"I've no time for OC prattle!" Leto countered. "How many?"

Halleck smiled at the Duke's frown of impatience said: "I can let him have three hundred of my finest, sire. Where shall I send them?"

"To the main gate. Hawat has an agent there waiting to take them."

"Shall I get about it at once, sire?"

"In a moment. We have another problem. I've bribed the field commandant to hold the shuttle until dawn. He . . ."

"Bribed, My Lord? Is this not *your* Duchy? You could . . ."

"Carefully and cautiously, Gurney. Do you doubt this place is a Harkonnen trap?"

"No, My Lord. It could be nothing else. I've agreed with you on that from the first. The bait's in the sand—this lovely spice—and underneath it you'll find bloody steel jaws ready to snap closed at the Harkonnen signal."

"Then we are still agreed. Now . . . I've *bribed* the commandant. He'll hold the shuttle on some pretext until daylight tomorrow. The Guild Heighliner that brought us is going on about its business, and the shuttle's supposed to make contact with a cargo ship, taking up a load of spice."

"Our spice, My Lord?"

"Our spice. But the shuttle also will carry some of the freedmen from the old regime . . . not *Fremen,* mind you, but spice workers, valuable laborers. About eight hundred of them. They've elected to leave at the change of fief, as is their option. Before the shuttle leaves, you must persuade some of those men to enlist with us."

"How strong a persuasion is required, sire?"

"I want their willing co-operation, Gurney. These men have experience and skills we need. We need them desperately. The fact that they're leaving suggests they're not part of the Harkonnen machine. Hawat believes there could be some bad ones planted in this group, but he sees assassins in every shadow."

"Thufir has found some very productive shadows in his time, My Lord."

"That's Hawat's job and I'm not complaining, Gurney. I just think planting sleepers in the outgoing crowd would show too much imagination for the Harkonnens."

"Possibly, sire. And where are these men?"

"On the lower level. I suggest you go down and play a tune or two to soften their minds, then turn on the pressure. You may offer positions of authority to those who qualify. You may offer twenty per cent higher wages than they received under the Harkonnens."

"No more than that, sire? To men with their pockets full of termination pay and the wanderlust on them, twenty per cent would hardly seem inducement to stay."

Leto spoke impatiently: "Then use your own discretion in particular cases. Just remember that the treasury is not bottomless. Hold it to twenty per cent wherever you can. We particularly need spice drivers, weather scanners, dune men—any with open sand experience."

"I understand, sire."

"Turn your own crew over to a lieutenant. Have him give a short drill on water discipline, then bed the men down for the night in the barracks adjoining the field. Field personnel will direct them. And don't forget the men for Hawat."

"Three hundred of the best, sire." He took up his spacebag. "Where shall I report to you when I've completed my chores?"

"I've taken over a council room on the third floor of this building. We'll hold our staff conference there. I want to arrange the planetary dispersal order as soon as possible, with armored squads going out first."

Halleck stopped in the act of turning away, caught Leto's eye. "Are you anticipating *that* kind of trouble, sire?"

"Both open battle and secret," the Duke said. "There'll be much blood spilled here before we're through."

"*And the water which thou takest out of the river shall become blood upon the dry land,*" Halleck quoted.

The Duke sighed. "Get your little job done and hurry back, Gurney."

"Very good, My Lord." The whipscar rippled to his grin. "*Behold, as a wild ass in the desert, go I forth to my work.*" He turned away, strode to the center of the room, paused to relay his orders, hurried on through the men.

Leto shook his head at the retreating back. Halleck was a continual amazement with his head full of songs, quotations and owery phrases . . . and the heart of an assassin when it came to the Harkonnens.

Presently, Leto took a leisurely diagonal course across to the lift. He recognized a propaganda corpsman, stopped to tell him a message that could be relayed to the men: those who had brought women would want to know that the women were safe and where they could be found. The others would wish to know that the population here appeared to boast more women then men. He slapped the man's arm, a signal that the message could be put out immediately, continued on his way across the room. He nodded to the men, smiled, traded pleasantries with a subaltern.

*Command must always look confident,* he thought. *All that faith riding on your shoulders while you sit in the critical seat and never show it.*

## XII

*Over the exit at the Arrakeen landing field, crudely carved as though with poor instruments, stretched an inscription that Muad'Dib was to recount many times. He saw it that first night on Arrakis, having been returned to the ducal command post at the field to participate in the first major staff conference. The words of the inscription were for the eyes of those leaving Arrakis, but they fell dark import on the eyes of a boy who had just escaped a close brush with death. They said: "O, you know what we suffer here, do not forget us in your prayers."*

*"Manual of Muad'Dib"*
*by The Princess Irulan*

"The whole theory of warfare is *calculated risk,*" the Duke said, "but when it comes to risking your own family, the element of *calculation* is submerged in . . . many other things."

He knew he wasn't holding in his anger as well as he should, and he turned, strode down the length of the long table and back.

The Duke and Paul were alone in the conference room —a barren place except for the table, the old-fashioned three-legged chairs around it, a map board and projector at one end.

Paul sat near the end of the table and close to the map board. He had just told his father about the hunter-seeker and the two tales that a traitor threatened him.

The Duke stopped across from Paul, pounded the table. "Hawat told me that house was secure!"

Paul spoke hesitantly: "I was angry, too . . . at first. And I blamed Hawat. But the threat came from outside the house. It was simple, clever and direct. And it would've succeeded were it not for the training given me by you and many others . . . including Hawat."

"Are you defending him?" the Duke demanded.

"Yes."

"He's getting old. That's it. He should—"

"He's wise with much experience," Paul said. "How many of Hawat's mistakes can you recall?"

"I should be the one defending him," the Duke said. "Not you!"

Paul smiled.

Leto sat down at the head of the table put a hand over his son's. "You've . . . matured lately, son." He lifted his hand. "It gladdens me." He matched his son's smile. "Hawat will punish himself. He'll direct more anger against himself over this than both of us could pour on him together."

Paul glanced toward the darkened windows beside the map board, looking at the night beyond them. The room's lights reflected from a balcony railing out there. He saw movement and recognized the shape of a guard in Atreides uniform. He looked back at the white wall behind his father, then down to the shiny surface of the table, seeing his own hands clenched into fists there.

The door opposite the Duke banged open and Thufir Hawat strode through it. His face looked older and more leathery than ever. He strode down the length of the table, stopped facing Leto.

"My Lord," he said, speaking formally and crisply, "I have just learned how I failed you. It becomes necessary that I tender my resig—"

"Oh, sit down and stop acting like a fool," the Duke said. He waved to the chair across from Paul. "If you made a mistake, it was in *over*estimating the Harkonnens. Their simple minds came up with a simple trick. We didn't count on simple tricks. And my son has been at pains to point out to me that he came through this largely because of your training. You didn't fail there!" He tapped the back of the chair. "Sit down, I say!"

Hawat sank into the chair. "But—"

"But nothing," the Duke said. "That incident is past. We have other and more pressing business. Where are the others?"

"I asked them to wait outside while I—"

"Call them in then."

Hawat looked into Leto's eyes. "Sire, I—"

"I know who my true friends are, Thufir," the Duke said. "Call in the men."

"At once, My Lord." He swiveled in the chair, called toward the open door: "Come in!"

Gurney Halleck led the file of men through the door. He was followed by the younger aides and specialists.

Brief scuffing sounds echoed around the room as the men took seats. Paul noted the grim tiredness in their appearance.

The Duke looked over his men, thinking: *They're a good crew. A man could do far worse picking fighters for this kind of war.* He nodded to himself, put on his mask of quiet efficiency and stood up. A knuckle rapped against the table commanded their attention.

"Well, gentlemen," Leto said, "our civilization appears to have fallen so deeply into the habit of invasion that we cannot even obey a simple order of the Imperium without the old habit cropping up."

Chuckles sounded around the table, and Paul realized that his father was an accomplished psychologist. He had said the precisely correct thing in the precisely correct tone. There was even a deliberate hint of fatigue in his voice.

"I think first we'd better learn if Thufir has anything new to add to his report on the Fremen," the Duke said. "Thufir?" Hawat glanced up. "I have some economic matters to add after my general report, sire. But I can say now that the Fremen appear more and more to be the kind of allies we need. Essentially, they are waiting to see if they can trust us. They're dealing openly, though. They've sent us a gift—stillsuits of their own manufacture, which are superior to all others, I might add; maps of certain desert areas to use in reducing certain strongpoints the Harkonnens left behind—" He glanced around the table. "Their intelligence reports have proved to be completely reliable thus far. They've also sent some incidental things—jewelry, spice liquor, candy, medicinals—my men are processing the lot right now, but there appears to be no trickery at all in their gifts."

"You like these people, Thufir," a man down the table asked.

Hawat turned to face his questioner. "Duncan Idaho says they're to be admired."

Paul glanced at his father, back to Hawat, ventured a question: "Do you have any new information on how many Fremen there are?"

Hawat looked at the Duke, then to Paul. "From the food processing and other evidence Idaho estimates the cave complex he visited consisted of some ten thousand people, all told. Their leader, a man called Stilgar, said himself that he ruled a *sietch* of two thousand hearths. We think there are a great many such *sietch* communities. They appear to give their allegiance to someone called Liet. That could be an error on my part, though, because there were things to suggest that this Liet could be a local diety."

"Is it certain they deal with the smugglers?" another man down the table asked.

"A smuggler caravan left Stilgar's *sietch* while Idaho was there, carrying a heavy load of spice on the backs of small horselike beasts. They indicated it was an eighteen-day journey to wherever they were going."

"It would seem," the Duke said, "that these romantic businessmen, the smugglers, have redoubled their operations during this change-over period. This deserves some thought. We shouldn't worry ourselves so much about unlicensed frigates working off our planet—it's always done—but to have them absolutely outside our observation is not a good thing."

"What do you suggest, My Lord?" Hawat asked.

The Duke looked at Gurney Halleck. "Gurney, I want you to head a delegation, an embassy, if you will, to contact these romantic businessmen. Tell them we'll ignore their operations as long as they give me a ducal tithe. Hawat believes that graft and all the extra fighting men their form of operation required has been costing them four times that amount."

"What if the Padishah Emperor gets wind of this?" Halleck asked. "He's very interested in CHOAM Company profits, I understand."

Leto smiled grimly. "We'll bank the tithe openly in the name of Shaddam IV. Let the Harkonnens fight that! And we'll be ruining a few more of the local money grubbers who grew fat under the Harkonnen system. No more graft!"

A half smile twisted Halleck's face. "A beautiful low blow, My Lord. Would I could see the Baron's face when he learns of this."

The Duke turned to Hawat. "Thufir, did you get those account books you said you could buy?"

"They are being examined in detail even now, My Lord."

"Tell the men what they indicate."

"The Harkonnens took ten billion solaris out of here every three hundred thirty standard days."

A muted gasp ran around the table. Even the younger aides, who had been betraying some boredom, sat up straighter and exchanged wide-eyed glances.

Halleck murmured: *"For they shall suck of the abundance of the seas and of the treasure hid in the sand."*

"You see, gentlemen," Leto said. "Is there anyone here so naïve that he believes the Harkonnens have quietly walked away from all this merely because the Emperor ordered it?"

There was a general shaking of heads, a low murmur of agreement.

"We will have to *take* it," Leto said. He turned to Hawat. "This would be a good point to report on the equipment. How many sand crawlers, harvesters, spice factories and supporting equipment have they left us?"

"A full complement, as it says in the Imperial inventory, My Lord," Hawat said. He gestured for an aide to pass a folder up the table, opened it in front of him. "They neglected to mention that less than half the crawlers are operable, that only about a third have carryalls to fly them—that everything the Harkonnens left us is ready to break down and fall apart. We'll be lucky to get half the equipment into operation and luckier yet if we have a fourth of it still working six months from now."

"Pretty much as we expected," Leto said. "Do you have any firm estimates on basic equipment?"

Hawat glanced at his folder. "About nine hundred and thirty harvester-factories that can be sent out in a few days. About sixty-two hundred and fifty ornithopters for survey, scouting and weather observation."

Halleck said: "Wouldn't it be cheaper to reopen negotiations with the Guild for permission to put a frigate in orbit as a weather satellite?"

The Duke glanced at Hawat. "Have you changed your first approximation on that?"

"We must pursue other avenues for now," Hawat said. "The Guild agent wasn't really negotiating with us. He was merely making it plain—one Mentat to another—that the price was out of our reach and would remain so. Our task is to find out why before we approach them again."

One of Gurney Halleck's aides down the table swiveled in his chair, snapped: "There's no justice in this!"

"Justice?" The Duke looked at the man. "Who asks for justice? We make our own justice. We make it here. Do you regret your decision to join us here?"

The man stared at the Duke, then: "No, sire. You couldn't turn down the richest single planetary source of income in the Imperium . . . and I could do nought but follow you. Forgive the outburst, but"—he shrugged—"we must all feel bitter at times."

"We do indeed," the Duke said. "Are any more of you harboring bitterness? If you are, let it out before it poisons you."

Halleck stirred, said: "The bitterest thing is that we've had no volunteers from the other Houses. They address you as 'Leto the Just' and promise eternal friendship, but they—"

"They wait for a sign of victory," the Duke said. "The Houses, most of them, have grown great by taking few risks. One cannot truly blame them for this. One can only despise them." He glanced at Hawat. "We were talking about equipment. Would you care to project a few examples to familiarize the men with this machinery?"

Hawat nodded, gestured to an aide down the table.

A solido tri-D projection appeared on the table surface about a third of the way down from the Duke. Some of the men farther down the table stood up to get a better look at it. Scaled against the tiny projected human figures around it, the machine was about one hundred and twenty meters long and about forty meters wide. It moved on independent sets of wide endless tracks.

"This is the latest model harvester-factory," Hawat said. "We chose one in good repair for this demonstration. There's one dragline outfit, though, that came in with the first team of Imperial ecologists and it's still running, although I don't know how . . . or why."

"If that's the one they call 'Old Maria,' it belongs in a museum," Halleck said. "I think the Harkonnens used it as a punishment job, a threat hanging over the heads of the workers. Be good or you'll be assigned to Old Maria."

Chuckles sounded around the table.

Paul didn't join in the humor. His attention was focused on the projection and the big question it raised in his mind. He pointed to the projection, said: "Thufir, are there sandworms big enough to swallow that? It must be more'n a hundred meters long!"

The men around the table froze, and the Duke cursed under his breath. But then he thought: *No. They have to face the realities here.*

"In the deep desert, there are worms that could take this entire factory in one gulp," Hawat said. "Up here close to the Shield Wall where most of the spicing's done there are plenty of worms that could cripple this factory and devour it at their leisure."

"Then why don't we shield them?" Paul asked.

"According to Idaho's report on the Fremen," Hawat said, "shields are dangerous to use in the desert. Apparently, a body-size shield will call every worm for many kilo miles around and it appears to drive them into a frenzy. We've no reason to doubt their word on this, and Idaho saw no evidence of shield equipment at the *sietch.*"

"None at all?" the Duke asked.

"None, sire. The lack of a thing is as significant as its presence," Hawat said. "The fact puzzles me, too, M'Lord. But I cannot judge without more data. The Harkonnens certainly used plenty of shields here. They had repair depots in every garrison village. And those account books we bought show an unusually large expenditure for shield replacements."

"Short of building up a shire-sized static-countercharge each time you want to burn out a shield, I've never heard of any method for nullifying one," Leto said. "What, then, could cause a large number of shields to require replacement? Could it be the sand?"

"They're sealed against moisture," Hawat said. "How could it be sand? Sand won't pass a moisture seal. No, sire. I'm inclined to believe the Fremen, but I also know there's more here than meets the eye."

"Could the Fremen have a way of nullifying shields?" Paul asked.

The Duke nodded agreement to the question.

"Anything's *possible,* of course," Hawat said. "But the Harkonnens were here for eighty years. Surely, they'd have gotten wind of it, used it, if such a device existed. And we'd have heard about it. The smugglers have close contact with the Fremen. They'd have acquired such a thing, too. And they'd have had no inhibition against marketing it off planet."

"I don't like unanswered questions," Leto muttered.

"The Fremen could be the reason for shield replacements, all the same," Paul said. "They could be such good fighters that they're killing off shielded men and capturing the shields."

"Three shielded men, backed into a defensive triangle, could stand off an unshielded army," Hawat said. "They could at least call for help and last until it arrived."

A man down the table looked at Hawat. "Could these Fremen have disguised their shields?"

"We think not. They do have much electronic equipment, and there were some who obviously understood shield function, but you couldn't mistake their attitude toward shields in general. They were mostly amused by them."

"Thufir," Leto said, "give priority to the solution of this problem."

"We're already working on it, M'Lord."

"Good. Then let's get back to the equipment."

Hawat nodded, gestured to his aide at the solido projector.

The harvester-factory was replaced by a winged device that dwarfed the projected human figures around it. "This is a carryall," Hawat said. "It's essentially a large 'thopter, and its sole function is to deliver a factory to a profitable site, then to rescue the factory when a sandworm appears. And they always appear. Harvesting the spice is a process of getting in and getting out with as much as possible."

"Admirably suited to Harkonnen morality," the Duke said.

Laughter was abrupt and loud.

An ornithopter replaced the carryall in the projected space.

"The 'thopters are fairly conventional," Hawat said. "Major modifications are to give them extended range. Extra care has been used in sealing essential areas against sand and dust. And one thing more: only about one in thirty is shielded. They have dropped shield generators as part of the redesign to increase range."

"I don't like this de-emphasis of shields," the Duke muttered. And he thought: *Does it mean our shields won't protect us? Is that the Harknonnen secret? Does it mean we cannot escape aboard a shielded frigate if all goes against us?* He shook his head sharply to drive out such thoughts. This was no way to think when everything depended upon clarity of mind. "Take over a room for training area, Thufir," he said. "Set up projectors and staff the room for briefing the people responsible for maintenance. Let's get on to the working estimate. What will our profit figure be?"

Hawat turned a page in his notebook. "After assessing the repairs and operable equipment, we've worked out a first estimate on operating costs. It's based, naturally, on a depreciated figure . . . for a clear margin of safety." He closed his eyes, and his voice took on the distant tone of *mentat* semitrance. "Under the Harkonnens, maintenance and salaries were held to fourteen per cent. We'll be lucky to make it at thirty per cent. With re-investment and growth factors accounted for—including the CHOAM percentage and military costs—our profit margin will be reduced to a very narrow six or seven per cent until we can replace the worn out equipment. We then should be able to boost it up to twelve or fifteen per cent where it belongs." He opened his eyes. "Unless M'Lord wishes to adopt Harkonnen methods."

"Not unless we get sand happy," the Duke growled. "We're working for a solid and permanent planetary base. To get that, we have to keep a large proportion of the people happy—especially the Fremen. Our supremacy on Caladan depended on sea power and air power. Here, we must develop a factor I choose to call *desert* power. That may include air power, but it's possible that it may not. The lack of 'thopter shields leaves the question in doubt. No." He shook his head. "The Harkonnens relied on turnover from off-planet for key personnel. We don't dare. Every new shipment could bring in a new batch of provocateurs."

"Then we'll have to be content with far less profit . . . and upon a reduced harvest of spice," Hawat said. "Roughly, our output the first two seasons should be down a third from the Harkonnen average."

"We have no choice," the Duke said. "And while we discuss profits, Thufir, have a delegation wait on the Guild Bank directors in Carthag. I want their headquarters moved back here."

"And if they refuse?"

"Tell them we'll submit it to the Landsraad. They dislike litigation that could complicate contractual negotiations in other spheres."

"We can ill afford litigation ourselves, sire."

"True. I don't think it will come to that, though. It would cloud the beginning of our association here. They don't wish to offend me any more than I wish to offend them. Each of us can institute measures that would reduce the other's profit."

"As you say, sire," Hawat said. "I wish only to caution that matters may not go as usual here. The Guild may agree that '*The Master Science Is The Law*,' but they've an eye for the main profit just as well as the next one."

"I submit that they cannot yet be sure where the main profit is on Arrakis. All depends on who maintains the initiative here. We are in a war of assassins, but it has not achieved full scale and others are not yet choosing sides. Our initial problem is to upset the Harkonnen machine here. In that, we have the initiative." The Duke looked at Hawat.

Hawat closed the book in front of him, shrugged. "All the results are not in, M'Lord. But we've eliminated two hundred and fifty-nine of their key people, broken up the major cell structure, and we're fighting only against them, not against the Fremen as well. I'll wager they never expected that."

"But perhaps they did expect it," the Duke said.

Hawat lowered his eyes, then glanced sharply at Leto.

The great age of Thufir Hawat suddenly impressed itself on Paul, and he looked at his father, back to Hawat, acutely aware that the old Mentat had served three generations of Atreides. *Aged.* It showed in the dull, rheumy shine of the man's washed brown eyes, in his cheeks cracked and burned by exotic weathers, in the rounded curve of his shoulders, in the thin set of his lips with their cranberry-colored stain of sapho juice.

*So much depends on one aged man,* Paul thought.

"No more than three Harkonnen cells remains, M'Lord," Hawat said. "And those only minor ones."

"These two hundred and fifty-nine Harkonnen creatures you eliminated," the Duke said, "did any of them have property?"

"Most were well situated in the population, M'Lord—in the entrepeneur class," Hawat said.

The Duke nodded. "Thufir, I want you to forge certificates of allegiance over the signatures of each of them. We will take the *legal* position that they stayed here under false allegiance. Once you've prepared the certificates, confiscate their property, and make sure the crown gets its ten per cent. It must be entirely legal."

Thufir smiled, revealing red-stained teeth beneath the carmine lips. "A move worthy of your grandsire, M'Lord. It shames me I did not think of it first."

Only Paul frowned. The others were smiling, nodding. But Paul felt a basic *wrongness* in the action. He knew the rules of *kanly* and the no-holds-barred convention that actually ruled, but this pointed in a direction that he felt could destroy them even as it gave them victory. The people of Caladan had grown soft of muscle and moral, that he recognized, and they'd not the wealth to buy weapons and mercenaries for open battle . . . still, the stealth and cynicism of his father's choice rankled. In the face of the general approval he could see around him, though, Paul remained silent.

"Another thing," the Duke said. "Today, we will issue the following proclamation: 'An oath of allegiance will be required of every human on Arrakis above the age of eight.' "

Gurney Halleck stirred, turned his glass-splinter eyes on the Duke. "That will create fear, My Lord."

And Paul thought: *Power and fear—the tools of statecraft.*

"It will not create fear among the lower classes, Gurney," the Duke said. "And I *want* fear among the entrepreneurs. This place shows all the signs of a typical Harkonnen cum CHOAM operation—a very few rich, none in between, and a mass of exploited semi-slaves on the bottom. The ones on top consider me a brash bumpkin. They didn't believe we would fight them here although they *knew* we couldn't fight them on Caladan. As yet, the ones on the bottom fear us only because we're the devil they don't know. This move won't escape their understanding. I want them to be very sure which direction our sword points. With those oaths of allegiance in my hands, I can rid myself of any of them, hanging a charge of ducal treason on them."

"And the ones on the bottom will see only that you move against their masters," Hawat said. "Excellent. They'll begin to love you for that."

Halleck's wide mouth tipped up into a half smile that twisted the sable scar on his jaw. He said: "I have been a stranger in a strange land." And he looked at Paul.

Paul recognized the quotation. It was from the OC Bible Yueh had given him, and the words were a cry to heaven for deliverance. *Does Gurney, too, wish an end to devious plottings?* Paul wondered.

The Duke looked at the darkness outside the windows, glanced at Halleck. "Gurney, how many more of those sandworkers did you persuade to stay?"

"We have two hundred and eighty-six in all, sire. I think we should take them and consider ourselves lucky. They're all in useful categories."

"No more?" the Duke asked. "Well . . . pass the word along to—"

A disturbance at the door interrupted him. Duncan Idaho came through the guard there, hurried down the length of the table and started to bend over the Duke's ear, but Leto waved him back.

"Speak out with whatever it is," the Duke said.

Paul watched Idaho, noting how his movements remained feline even in hurry, how the dark round face with its cave-sitter eyes retained a mask of serenity even in excitement.

"We've taken a force of Harkonnen mercenaries disguised as Fremen, M'Lord," Idaho said. "The Fremen themselves sent in a courier to warn us where to be. In the attack, though, we found that the Harkonnen force had just waylaid the Fremen courier and badly wounded him. We were bringing the courier back for treatment by our own doctors when he died. I could see he was badly off and had stopped to do what I could, and I surprised the man in the attempt to throw something away. It was a knife, M'Lord, such a beautiful knife as I have never before seen—milky white and glowing with an inner light." He reached into his tunic, brought forth a sheath with a black ridged handle protruding from it.

"Do not unsheath that blade!"

The voice was low, vibrant and penetrating. It came from the open door behind Idaho where a tall robed figure stood, barred by the crossed swords of the guard. The speaker was completely enveloped in robe, hood and dark veil except for a slit that exposed eyes of total blue—no whites in them.

"Let him enter," the Duke said.

The guardsmen hesitated, then lowered their swords.

The Fremen swept into the room, stood at the end opposite the Duke.

"Welcome, sir," Leto said. "And why should we not unsheath this blade?"

Leto awaited the answer, suspecting that he had here a rare opportunity to improve relations with the Fremen. This man bore himself like a leader . . . a *Fremen* leader.

Paul's thought, almost identical, differed in its touch of awe. Such an aura of power radiated from the robed man.

"You have not earned the right to unsheath that blade," the Fremen said. And, as a mutter of protest sounded around the table, he held up a thin and darkly veined hand. "I remind you also that it is the blade of one who befriended you."

Someone down the table muttered, "Who's he to tell us what rights we have on Arrakis?"

"It is said that the Duke Leto Atreides rules with the consent of the governed," the Fremen said. "Thus, I must say to you, moreover, that a certain responsibility falls on those who have seen a crysknife. "They are ours. They may never leave Arrakis."

Halleck and several of the others started to arise, angry expressions on their faces. Halleck said: "The Duke determines whether—"

"One moment, please," Leto said. And he thought: *This must not get out of hand!* He addressed the Fremen: "Sir, we are indeed indebted to you. If it is your custom that this knife remain sheathed, then it is so ordered. If there is any other way we may honor the man who died in our service, you have but to name it."

The Fremen stared at the Duke, then slowly pulled aside the veil, revealing a thin nose and full-lipped mouth in a glistening black beard. Deliberately, he bent over the end of the table, spat on its surface.

As the men around the table started to surge to their feet, Idaho's voice boomed across the room: "Hold!"

Into the sudden stillness, Idaho said: "We thank you, sir, for your body's moisture, and accept it in the spirit with which it is given." Aside to the Duke, he said: "That was a token of respect, sire. Remember how precious water is here."

The Duke nodded, sensing the slow relaxation around the table as men sank back into their chairs.

The Fremen looked at Idaho, said: "You came among us to my *sietch.* You measure well. Would you return among us to replace the one lost?"

"My word of service is given to the Duke," Idaho said.

Leto looked at Idaho, who still stood stiffly, the sheathed knife in his hands. "You could spread your allegiance, Duncan, if our Fremen friend permits it."

"You wish me to go with him, sire?" Idaho asked.

"I wish you to make your own decision in the matter," Leto said, and he could not conceal the edge of urgency he felt.

Idaho looked at the Fremen. "Would you have me under these conditions, sir? There will be times when I must return to serve my Duke."

"You fought well against that pack of vultures and you did your best for our friend," the Fremen said. "We'll have you." He turned back to the Duke. "Let it be thus: the man Idaho keeps the knife he holds. He serves us both, but his water is ours. The body of our friend remains with you. His water is yours. It is a bind between us. Again, he looked at Idaho. "I will await below while you make farewell with your friends." He started to turn away.

"Will you not stay a while?" the Duke asked.

The Fremen turned back, whipping his veil into place with a casual gesture, and adjusting something beneath it. Paul glimpsed what looked like a thin flexible tube before the veil settled into place.

"Is there reason to stay?" the Fremen asked.

"We would honor you," the Duke said.

"Honor requires that I be elsewhere soon," the Fremen said. He shot another glance at Idaho, turned and strode out through the door guards.

"I like that man," Leto said. "If the other Fremen match him, we'll serve each other well."

"He's a fair sample," Idaho said in a dry voice.

Leto studied Idaho. "You understand what you're to do? You're our ambassador to the Fremen now. Much depends on you."

Idaho said: "What I was about to tell you is the thing we learned from one of the mercenaries we took. He was trying to get this blade from the Fremen when we struck. The mercenary says there's a Harkonnen reward of a million solaris for anyone who'll bring in a crys-knife."

There was a concerted gasp around the table.

Leto looked speculatively at the blade in Idaho's hands, then shook his head. "We're playing for higher stakes, but your first assignment is to find out why the Harkonnens want one of those blades so badly."

"I already know, sire."

Leto looked up into Idaho's eyes, waiting.

"The Harkonnens are only intermediaries," Idaho said. "Our captive says the real buyer is the Guild."

"I'll want to question this captive more closely," Leto said.

"He's with my . . . squad below, sire."

"I'll also want to find out how that Fremen got into this building with—"

"He came in with his troop, with us, sire," Idaho said. "They caught up with us at the entrance and demanded their friend's body. I brought them into the main hall with us and asked them to wait while I consulted you. They must've found this knife gone after I'd left them and—" He shrugged.

"Send me a written report on the entire incident at your first opportunity," the Duke said. "For now, I suspect you'd best not keep our friend waiting."

"What about this knife, sire?"

"He said it was yours," Leto said. "If there's really such an offer out, we'll see about meeting it later. Meanwhile, do nothing to jeopardize our position with the Fremen. The knife is yours. The rewards it could earn you may be far greater than this alleged Harkonnen-Guild offer."

Idaho slipped the sheathed knife beneath his tunic. "May I leave then, sire?"

"By all means, and speedily," the Duke said.

"I've a transmitter and I'll report as soon as possible," Idaho said, "Thufir has my code. I'll use battle language." He turned and hurried out of the room. They heard his footsteps beating down the hall.

Leto looked at Hawat. "That knife interests me, Thufir. If it's true there's a bounty for one, we must find out why before ever thinking of collecting."

"Likely it's one of those fables, sire," Hawat said. "Every planet has them." He shrugged. "But we can't assume that."

The Duke again looked down the length of the table at the door, the guards. The major reason for this meeting had been to imbue the men with the mystique of victory and to acquaint them with the necessary realities and, while he felt no immediate loss of the initiative, still he knew that much escaped them. The danger potential of this planet remained high. He glanced down at Paul, met the young eyes studying him. Paul ventured a slight smile.

"We've much to do, sire," Halleck said.

"And I keep you from your work," Leto said. He rapped a knuckle on the table, becoming anew the incisive ruler. "All right, then—we know what we have ahead of us: work. We've been trained for it. We know what the rewards are. We know what the alternatives are. You all have your assignments." He looked at Halleck. "Take care of that smuggler situation right away, Gurney."

"I shall go unto the rebellious that dwell in the dry land," Halleck intoned.

"Someday I'll catch that man without a quotation and he'll look undressed," the Duke said.

Chuckles echoed around the table.

The Duke glanced at Hawat. "Set up an intelligence command post on this floor, Thufir. When you have your command post moved, I'll want to see you."

"Yes . . . sire." Hawat looked at Paul. "Best your son remain the rest of the night here. I'll inform the Lady Jessica."

And Paul, watching the old man, saw the subtle hesitations, the signs of unrest. Hawat was deeply troubled.

"Before we break this up, sire," Hawat said, "I have some pertinent information . . . economic information."

All eyes focused on him.

"It is said among the Fremen," Hawat said, "that there were more than two hundred advance bases built in sheltered places out in the desert under Imperial bequests and then abandoned. They're very old, part of the Desert Botanical Testing Station period. But all apparently were sealed down before abandonment. They're complete, loaded with equipment—"

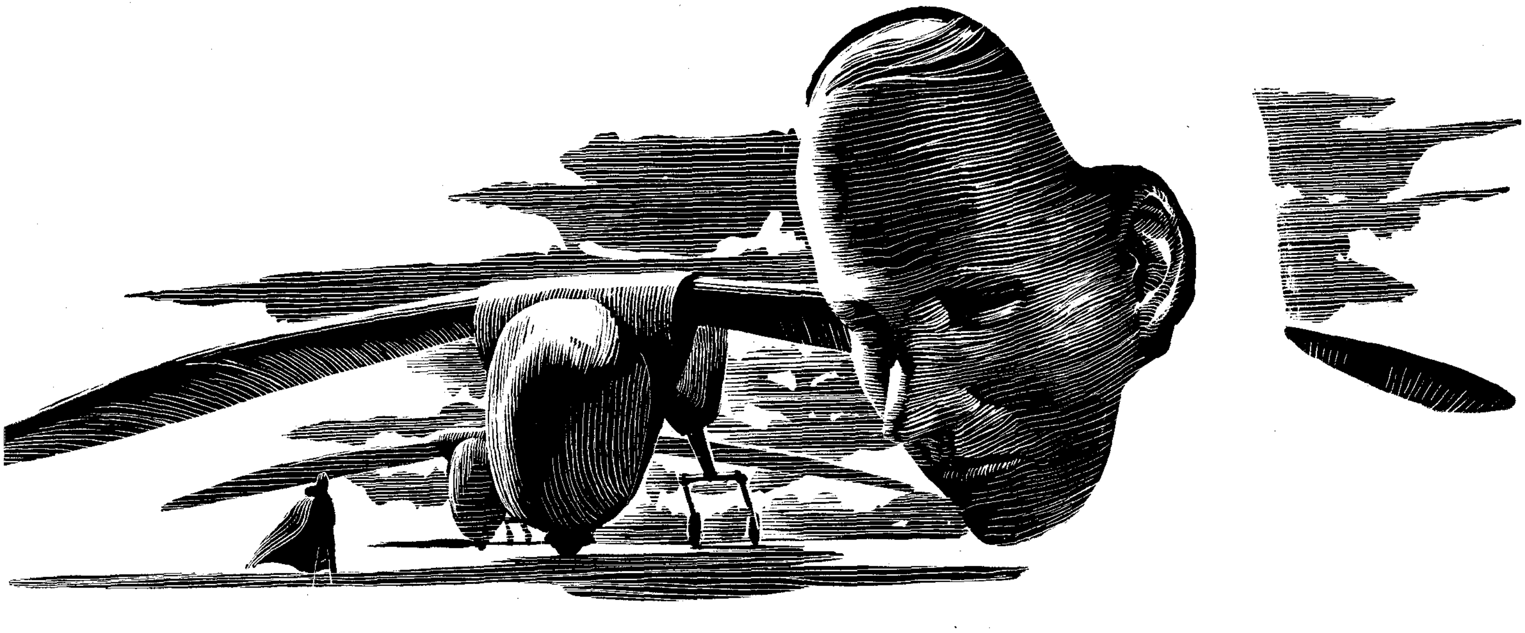
"Where are they?" the Duke asked.

"The answer to that question," Hawat said, "is invariably '*Liet knows.*'"

"God knows," Leto muttered.

"Is there reason to believe this . . . report?" the Duke asked.

Hawat shrugged. "Idaho doesn't believe the Fremen



ever lied to him. He was impressed with their system of honor."

"This planet still has an Imperial ecologist," Leto said. "Name's Kynes."

"Sire," Hawat cautioned, "Kynes is the Imperial Observer on this change of government."

"I know," Leto said. "But we must find out about those bases. They'd be loaded with materials we could salvage for repair of our working equipment!"

"Sire!" Hawat said. "Those bases would still be part of His Majesty's fief!"

An aide down the table said: "And they could be a myth."

Another aide said: "How could such things be—out in all that desert sand?"

Leto said: "Only about a third of that desert is sand. Most of it's bare rock. There could be hundreds of hiding places . . . thousands."

"But 'twere dangerous to commandeer them," Hawat said.

"The weather here's savage enough to destroy anything," Leto said. "Get that Kynes fellow and chase this down! If there are such bases, I want them scavenged!"

Paul drew back from the wildness in his father's voice. He had never seen so much violence that close to the surface in him.

"My Lord," Hawat said, "Fremen hold this matter important. I'd stake my reputation the bases actually exist. It's difficult to fool Duncan—"

"Are you saying we might alienate the Fremen by taking those bases?" Leto asked.

"I do suspect it, sire. Only a hunch . . . yet—" He shook his head and glanced around the room as though seeking support. "It would be rash to move in this direction without greater knowledge. These bases could give us material to repair every piece of equipment, yet be beyond our reach for strategic reasons. Kynes has arbiter authority, sire. These bases might offer us areas of local operation, cutting down the wear on what equipment we do have, reducing maintenance and power costs, yet be more costly because they bring down Fremen wrath upon us."

*But we are desperate,* the Duke told himself, admitting it and then rejecting it lest the thought betray itself in his actions.

"Look into the matter, Thufir," he said. "Bring in this Dr. Kynes and squeeze him . . . gently . . . for what he knows." He waved his hand in dismissal, watched silently as the men filed out of the room. He glanced at Paul, still seated beside him, feeling let down.

Paul felt a sense of insufficiency about the meeting. He'd sat in staff before. There had always been a definitive incisive air about them at the end. This meeting had seemed to just trickle out, worn down by its own inadequacies. For the first time, Paul allowed himself to think about the real possibility of defeat . . . not thinking about it out of fear because of warnings such as that of the old Reverend Mother's, but facing up to it because of his own assessment of the situation.

*My father is desperate,* he thought.

"Why don't you pull a few of these chairs together and stretch out on them for a little rest, Paul?" the Duke asked.

"I'm not very tired, sir."

"As you will." The Duke folded his hands behind him, began pacing up and down along the length of the table.

*Like an animal in a cage,* Paul thought. *And Hawat was worried, too. And he didn't speak his worry in staff. That's wrong.*

"Are you going to discuss the traitor warning with Hawat?" Paul asked.

"Thufir and I've talked over that possibility many times," Leto said. He paused across the table, stared down at his son.

"But the old woman seemed so sure of herself, and mother said—"

"We'll look into it," the Duke said. "Precautions have been taken." He glanced around the room. "Remain here. I want to see about the command post." He turned, strode out of the room, nodding shortly to the guards at the door.

Paul stared at the place where his father had been. The space had been empty even before the Duke left the room. And he recalled the Reverend Mother's warning: "*. . . For the father, nothing.*"

## XIII

*On that first day, when Muad'Dib rode through the streets of Arrakeen with his family, some of the people along the way recalled the legends and ventured to shout: "Mahdi!" But their shout was more a question than a statement, for as yet they could only hope he was the one foretold by the Lisan al-Gaib, the Voice from the Outer World. And their attention was focused much on the mother because it was obvious to them that she was like the Lisan al-Gaib.*

*"Manual of Muad'Dib"*
*by The Princess Irulan*

The Duke found Thufir Hawat alone in the corner room to which the guard directed him. There was the sound of men setting up communications equipment in an adjoining room, but this place was fairly quiet. It was a green-walled enclosure with three suspensor chairs from which the Harkonnen "H" had been hastily removed, leaving an imperfect color patch over the erasure.

"The chairs are liberated but quite safe," Hawat said. He glanced at the door through which the Duke had entered. "Where is Paul, sire?"

"I left him in the conference room. I'm hoping he'll get some rest without me there to distract him."

Hawat nodded, crossed to the door to the adjoining room, closed it, shutting off the noise of static and electronic sparking.

"Thufir," Leto said, "the Imperial and Harkonnen stockpiles of spice attract my attention."

"M'Lord?"

The Duke pursed his lips. "Storehouses are susceptible to destruction, Thufir." He raised a hand as Hawat started to interrupt. "Ignore the Imperial stockpile. The Padishah Emperor would secretly enjoy it if the Harkonnens were discomfited. And can the Baron object if something is destroyed which he cannot admit openly that he has?"

"We've few men to spare, sire." Hawat shook his head.

"Get some of Idaho's men," the Duke said. "A raid on Giedi Prime. There are tactical advantages to such a diversion."

Hawat bowed, turned away. And again the Duke saw the evidences of nervousness he had detected during the staff conference. *Perhaps he suspects that I distrust him,* the Duke thought. *He must know I have private reports of traitors. Well . . . best quiet that fear immediately.*

"Thufir," he said, "since you're one of the few I can trust completely, there's another matter bears discussion between us. We both know how constant the watch must be to keep traitors from infiltrating our force. But I have two new reports."

And Leto told Hawat the stories Paul had brought.

Instead of bringing on that intense Mentat concentration in Hawat, the reports only increased his agitation.

Leto studied the old man and presently said: "You've been holding something back, old friend. I should've suspected when you were nervous during staff. Well, what is it that was too hot to dump in front of a full conference? What is you hesitate to tell me even now?"

Hawat's sapho-stained lips were pulled into a prim straight line with tiny wrinkles radiating into them. They kept their wrinkled straightness as he said: "M'Lord, I don't quite know how to broach this."

"We've suffered many a scar for each other, Thufir," the Duke said. "You know you can broach *any* subject with me."

Hawat nodded, thinking: *This is how I like him best. This is the man of honor who deserves every bit of my loyalty and service. Why must I hurt him?*

"Well?" Leto demanded.

"M'Lord, it's a thing that could have great consequence or no consequence. It's a thing susceptible to various interpretation and—"

"Don't bandy words with me, Thufir."

Hawat shrugged. "It's a scrap of a note. We took it from a Harkonnen courier. The note was intended for an agent named Pardee. We've good reason to believe Pardee was top man in the Harkonnen secret organization here."

"What's the delicate content of this note?"

"Scrap of a note, M'Lord. Not the entire note. It was on minifilm with the usual destruction capsule attached. We stopped the acid action just short of complete erasure. However, the remaining fragment is extremely suggestive."

"Well, get to it, man!"

Hawat shrugged. "It says: '*. . . eto will never suspect, and when the blow falls on him from a beloved hand, its source alone should be enough to destroy him.*' The note was closed with the Baron's own seal."

"Your suspicion is obvious," the Duke said.

"I'd sooner cut off my arms than hurt you needlessly," Hawat said. "M'Lord, what if—"

"The Lady Jessica," Leto said. He glared at Hawat. "Couldn't you wring the facts out of this Pardee?"

"Unfortunately, Pardee no longer was among the living when we intercepted the courier. It is certain the courier knew nothing of what he carried."

"I see." Leto shook his head, thinking: *What a slimy piece of business. There cannot be anything in it. I know my woman.* "No!" he barked. "This is too imaginative even for the Harkonnens. There's a mistake that—"

"The Harkonnens are known to hire imaginative people, M'Lord."

"She's been with me for sixteen years! There've been countless opportunities for— You yourself investigated the school and the woman!"

Hawat spoke bitterly: "Things have been known to escape me."

"It's impossible. I tell you! The Harkonnens want to destroy the Atreides line—meaning Paul, too. Could a woman conspire against her own son?"

"It has been known, sire. The Bene Gesserits of the Schools are not supposed to know their parentage, but what if she knew and were an orphan? What if she were orphaned by an Atreides?"

"If this were true, she'd have moved long before now. Poison in my drink . . . a stiletto. Who has had better opportunities?"

"The Harkonnens mean to *destroy* you, M'Lord. Don't ignore the language of this note. Their intent is not just to kill you. There's fine distinction in *kanly* revenge. This could be a work of art in the annals of vendettas."

The Duke's shoulders slumped. He closed his eyes, looking suddenly old and tired. *It cannot be,* he thought. *The woman has opened her heart to me.*

"What better way to destroy me than to make me suspicious of the woman I love?" he asked. He opened his eyes, stared at Hawat.

"An interpretation that has not escaped me," Hawat said. "Still—"

*Let him be suspicious,* Leto thought. *Suspicion is his trade. It is not mine. And, perhaps if I appear to agree to this suspicion, that will make another man careless.*

"What do you suggest?" the Duke whispered.

"For now, constant surveillance, M'Lord. She should be watched at all times. I will see it's done unobtrusively, by trusted operatives."

"And what about Paul?"

"I suggest we alert Dr. Yueh."

"Dr. Yueh!" Leto barked. "What if he were the—"

"If there's one thing certain in this universe, M'Lord, it's High College training. The compulsion to preserve life is hypnotically imbedded in them to such a depth that it cannot be removed except by death. They're conditioned for *royal* service, M'Lord."

Leto turned his back on Hawat. "I leave it in your hands."

"I'll recall Idaho to do the watching, M'Lord. I shall use discretion, M'Lord."

*At least I can be confident of that,* Leto thought. He said: "I will take a walk. If you need me, I'll be within the perimeter. The guard can—"

"M'Lord, before you go, I've a filmclip here you should read at your first opportunity. It's a first approximation analysis on the Fremen religion. You'll recall that you asked me earlier to investigate what it was the crowd was shouting as you passed yesterday morning."

"Is it urgent, Thufir?" He turned halfway back.

"No, M'Lord. When they shouted 'Mahdi!' that was directed at the young master. When—"

"At Paul?"

"Yes, M'Lord. There's a legend here that a leader will come to them, to lead them to power in the universe. They've had a prophet something called Lisan al-Gaib, The Voice From the Outer World. They expect another . . . perhaps a messiah."

"And they think *Paul* is this . . . this—"

"They only hope, M'Lord. They're not sure."

The Duke accepted the filmclip capsule, thrust it into a pocket. "I'll look at this later. Right now . . . I need time to think."

"Yes, M'Lord."

The Duke took a deep, sighing breath, turned away and strode out the door. *I must walk and think,* he thought. And he walked. There were corridors, and stairs, and balconies, and halls—people who saluted and stood aside for him. In time, he came back to the conference room, found it darkened and Paul asleep on the table with a guard's robe thrown over him. The Duke walked softly down the length of the room and onto the balcony overlooking the landing field. A guard at the corner of the balcony snapped to attention, recognizing the Duke in the dim reflection of lights from the field.

"At ease," the Duke murmured. He turned away and leaned against the cold metal of the guard rail.

A pre-dawn hush had come over the desert basin. He looked up. Straight overhead the stars were a sequin shawl flung over blue-black. Low on the southern horizon, the night's second moon peered through a thin dust haze—an unbelieving moon that looked at him with a cynical cast.

As the Duke watched, the moon dipped beneath the cliffs, and in the sudden intensity of darkness, he experienced a chill. He shivered.

Anger shot through him. *The Harkonnens have hindered and hounded and hunted me for the last time,* he thought. *They are dung heaps with village provost minds! Here, I make my stand!* And he thought with a touch of sadness: *I must rule with eye and claw—as the hawk among lesser birds.*

To the east, the night brew a faggot of luminous gray, then sea-shell opalescence that dimmed the stars. There came the long, bell-tolling movement of dawn striking across a broken horizon.

It was a scene of such beauty that it caught all his attention.

*Some things beggar likeness,* he thought.

He had never imagined anything here could be as beautiful as that shattered red horizon and those purple and ochre cliffs. Beyond the landing field where the night's faint dew had touched life into the hurried seeds of Arrakis, he saw great puddles of red blooms and, running through them, an articulate tread of violet like giant footsteps.

"It's a beautiful morning, sire," the guard said.

The Duke nodded, thinking: *Perhaps this planet could grow on one. Perhaps it could be a good home for my son.*

Then he saw the human figures moving into the flower field, sweeping it with strange scythe-like devices—water so precious here that dew gatherers must collect it.

*And it could be a terrible and hateful place,* he thought.

## XIV

*"There is probably no more terrible instant of enlightenment than the one in which you discover that your father is a man—with human flesh."*

*"Collected Sayings of Muad'Dib"*
*by The Princess Irulan*

The Duke said: "Paul, I'm doing a hateful thing, but I must."

He stood beside the portable poison snooper that had been brought into the conference room for their breakfast. The sensor arms of the thing hung limply over the table, looking to Paul like some weird insect newly dead.

The Duke's attention was directed out the windows at the landing field and its roiling of dust against the morning sky.

Paul had a viewer in front of him containing a short filmclip of Fremen religious practices. The clip had been compiled by one of Hawat's experts and Paul found himself disturbed by the references to himself.

*"Mahdi!"*

*"Lisan al-Gaib!"*

He could close his eyes and recall the shouts of the crowds as they passed. *So that is what they hope,* he thought. And he remembered what the old Reverend Mother had said . . . *Kwisatz Haderach.* The memories touched his feelings of Terrible Purpose, shading this strange world with a sensation of familiarity that he could not understand.

"A hateful thing," the Duke said.

"What do you mean, sir?"

Leto turned, looked down at his son. "Because the Harkonnens think to trick me by making me distrust your mother. They don't know that I'd sooner distrust myself."

The words shocked Paul and he blurted out: "Distrust mother? I don't understand."

Leto looked away out the windows and across the field. The white sun was well up into its morning quadrant. Milky light picked out a boiling of dust clouds that spilled over into the blind canyons interfingering the Shield Wall. Slowly, speaking in a low voice to contain his anger, he explained to Paul about the note.

"You might just as well distrust me," Paul said.

"They must think they've succeeded," the Duke said. "They must think me this much of a fool, and even she must not know otherwise."

"But, sir! Why?"

"I hope to smoke out the real traitor. Your mother's response must be no act. Oh, she's capable of a supreme act . . . more capable than anyone I know, perhaps, but too much rides on this venture. It must seem that I've been cozened completely. For this, she must be hurt that she does not suffer greater hurt."

"But, sir, if—"

"It must be this way!"

Paul heard the finality in his father's voice. "Then why do you bother telling me? Perhaps I won't be a good enough actor. I may give away your—"

"You'll keep the secret," the Duke said. "You'll do it because you're my son and you must. I command it." He walked to the windows, spoke without turning. "This way, if anything should happen to me, you can tell her the truth—that I never doubted her."

Paul recognized the death thoughts in his father's words, spoke quickly: "Nothing's going to happen to you, sir. The—"

"Be still, son."

Paul fell silent, staring at his father's back, seeing the fatigue in the angle of the neck, the line of the shoulders.

"You're just tired," Paul said.

"I *am* tired," the Duke agreed. "I'm morally tired. The melancholy degeneration of the Great Houses has afflicted me at last, perhaps. And we were such strong people once."

Paul spoke in quick anger: "Our House hasn't degenerated!"

"Hasn't it?" The Duke turned and faced his son, revealing the dark circles beneath the hard eyes, the cynical twist of mouth. "I should wed your mother, make her my Duchess. Yet . . . my unwedded state gives some Houses the hope they may yet ally with me through their marriageable daughters." He shrugged. "So I—"

"Mother knows how it is."

"Nothing wins more loyalty for a leader than an air of bravura," the Duke said. "Therefore, I cultivate an air of bravura."

"You lead well," Paul protested. "You govern well. Everyone says it."

"My propaganda corps is one of the finest," the Duke said. Again, he turned away to stare out at the basin landscape. "There is greater possibility for us here on Arrakis than the Imperium could ever suspect. Yet, sometimes I think it would be better for us if we could sink back into anonymity among the people, lose our privileges by becoming less exposed to—"

"Father!"

"Yes, I *am* tired," he said. "Did you know that we're using spice residue as a raw material and already have our own plant set up to manufacture filmbase?"

Hoping that his father was emerging from the melancholy mood, Paul spoke brightly: "Do they have a production estimate?"

"More than enough to meet our needs," the Duke said. "We'll be able to flood the cities and villages with our information. After all, the people must know how well I govern them. And how would they know if we didn't tell them?" Again, the Duke turned to face his son. "And Arrakis has another advantage I almost forgot to mention. Consider the uses of poison in our society. We find now that a heavy spice diet imparts a certain natural immunity to some poisons. It makes one more resistant. And because of the need to watch all water consumption here, food production—both yeast culture and hydroponics—is very carefully guarded, sealed off from the environment and the casual intruder. It would be most difficult to weaken us by poisoning any large segment of our subjects."

As Paul started to speak, the Duke cut him off, saying: "I have to have someone I can say these things to." He sighed, glanced back at the dry landscape where even the flowers were gone now—trampled by the dew gatherers, wilted under the early sun.

"On Caladan, we ruled with sea and air power," the Duke said. "Here, we must scrabble for desert power. This is your inheritance, Paul. What is to become of you if anything happens to me? You will not be a Renegade House . . . but a guerrilla house, running, hunted—"

Paul groped for words, could find nothing to say.

"To hold Arrakis," the Duke went on, "one is faced with decisions that may cost one's self respect." He pointed out the window at the Atreides green and black banner hanging limply from a staff at the side of the landing field. "That flag could come to mean many evil things here," he said.

Paul swallowed in a dry throat. His father's words conveyed futility, a sense of fatalism that left the boy with an empty feeling in his chest.

The Duke took an antifatigue tablet from his pocket, gulped it dry. "Power and fear," he said, "the tools of statecraft. And I must order a new emphasis on guerrilla training for you, son. You studied that filmclip there. The Fremen call you Mahdi—Lisan al-Gaib. As a last resort, you might capitalize on that."

Paul stared silently at his father, watching the shoulders straighten as the tablet did its work, but remembering the words of fear and doubt and indecision.

"What's keeping that ecologist?" the Duke muttered. "I told Thufir to have him here early."

## XV

*A thing many laymen never realize about an ecological system is that it* is *a system. A system, by definition, maintains a certain fluid stability which can be destroyed by the removal of* any *element from its niche within the system. There is, also, a certain point-to-point flowing of a system. Any unexplained gap in this flow tells you there's an unknown occupant of a niche within the system. For example, the Arrakeen ecologist, Liet-Kynes, knew that the planetary system of Arrakis sheltered the creature called "Water Seeker" long before he found and identified it. He saw the gap in the system.*

*"Maud'Dib's Collected Lectures:*
*The Secret Ecology of Arrakis"*
*Edited by The Princess Irulan*

His first encounter with the people he had been ordered to betray left Dr. Kynes shaken. He prided himself on being a scientist to whom legends merely were interesting clues, pointing toward cultural roots. (And he had long suspected the actual source of the Arrakeen Mother Goddess cum Messiah legends.) Yet, the boy fitted the legend's description so precisely. He had the "questing eyes," and the air of "reserved candor." Of course, the legends left a certain latitude on whether the Mother Goddess would bring the Messiah with her or produce him on the scene. Still, there was this odd correspondence of prediction and persons.

They met in midmorning outside the Arrakeen landing field's administration building where, rumor had it, the Duke had set up his command post. An unmarked ornithopter squatted nearby, humming softly on standby like a somnolent insect. An Atreides guard stood beside it with bared sword and the faint air distortion of a shield around him.

Kynes sneered at sight of the shield pattern, thinking: *Arrakis has a surprise in store for them there!*

He raised a hand, signaled for his Fremen guard to fall back, strode on ahead toward the building's main entrance—the dark hole in the plastic-coated rock. So exposed, that monolithic building, he thought. So much less suitable than a cave.

A movement in the entrance caught his attention, and he stopped, taking the moment to adjust his robe and the set of his stillsuit at the left shoulder.

The doors swung wide at the entrance. Atreides guardsmen emerged, all armed with slow pellet stunners and swords, all shielded. Behind them came a tall man, hawk-faced, dark of skin and hair. He wore a jubba cloak with Atreides crest at the breast and wore it in a way that betrayed his unfamiliarity with the garment. It clung to the legs of his stillsuit on one side and lacked a striding rhythm. Besides the man walked a youth with the same dark hair, but rounder in the face. The youth seemed small for the fifteen years Kynes knew him to have. But the young body carried a sense of command, a poised command, as though he saw and knew things around him that were not visible to others. And he wore the same style of jubba cloak as the father, yet with a casual ease that made one think the boy had always worn such clothing.

*"The Mahdi will be aware of things that others cannot see,"* went the legend.

Kynes shook his head, telling himself: *They're just two people!*

With man and youth, garbed like them for the desert, came one Kynes recognized—Gurney Halleck. Kynes took a deep breath to still his resentment against Halleck, who had briefed him on how to *behave* with Duke and ducal heir.

*"You may call the Duke 'My Lord' or 'Sire.' 'Noble Born' is correct, but usually reserved for more formal occasions. The son may be addressed as 'Young Master' or*

*'My Lord.' The Duke is a man of much leniency, but he brooks no familiarity."*

And Kynes thought as he watched the people approach: *They'll learn soon enough who's master on Arrakis. Order me questioned half the night by that mentat, will they? They expect me to guide them on a review of the spice mining, do they?*

The import of Hawat's questions had not escaped Kynes. They wanted the Imperial bases. And it was obvious they'd learned about the bases from Idaho.

*There is one who will die,* Kynes told himself. *I will have Stilgar send Idaho's head to this Duke.*

The ducal party was only a few steps away now, their feet in desert boots crunching in the sand.

Kynes bowed. "My Lord Duke," he said.

As he had approached the solitary figure standing near the ornithopter, Leto had studied him: Tall, thin—dressed for the desert in loose robe, stillsuit and desert boots. The hood was thrown back, its veil hanging to one side, revealing long sandy hair, a sparse beard. The eyes were that fathomless blue-within-blue under thick brows and there were the remains of dark stains beneath them.

"You're the ecologist," the Duke said.

"We prefer the old title here, My Lord," Kynes said. "Planetologist."

"As you wish," the Duke said. He glanced down at Paul. "This is my son."

"My Lord," Kynes said.

"Are you a Fremen?" Paul asked.

Kynes smiled. "I am accepted in both *sietch* and village, Young Master. Primarily, I am in His Majesty's service as the Imperial Planetologist."

Paul nodded, impressed by the man's air of strength. Gurney had pointed Kynes out to Paul from the upper window of the administration building: *"The man standing there beyond the 'thopter."* And Paul had inspected Kynes briefly with binoculars, noting then the prim straight mouth, the high forehead. Gurney had spoken into Paul's ear: *"Odd sort of fellow. Has a precise way of speaking—clipped off, no fuzzy edges."*

And the Duke, behind them, had said: *"Scientist type."*

Now, only a few feet from the man, Paul sensed the power in Kynes' personality—as though he were blood royal, born to command.

"I understand we have you to thank for our stillsuits and these cloaks," the Duke said.

"I hope they fit well, My Lord," Kynes said. "They're of Fremen make and as near as possible to the dimensions given me by your man Halleck here."

"I was interested that you said you couldn't take us into the desert unless we wore these garments," the Duke said. "We can carry plenty of water. We don't intend to be out very long and we'll have an air cover—my escort you see overhead right now. It isn't likely we'd be forced down."

Kynes stared at him, seeing the water-fat flesh. He spoke coldly: "You never talk of likelihoods on Arrakis. You speak only of possibilities."

Halleck stiffened. "The Duke is to be addressed as My Lord or Sire!"

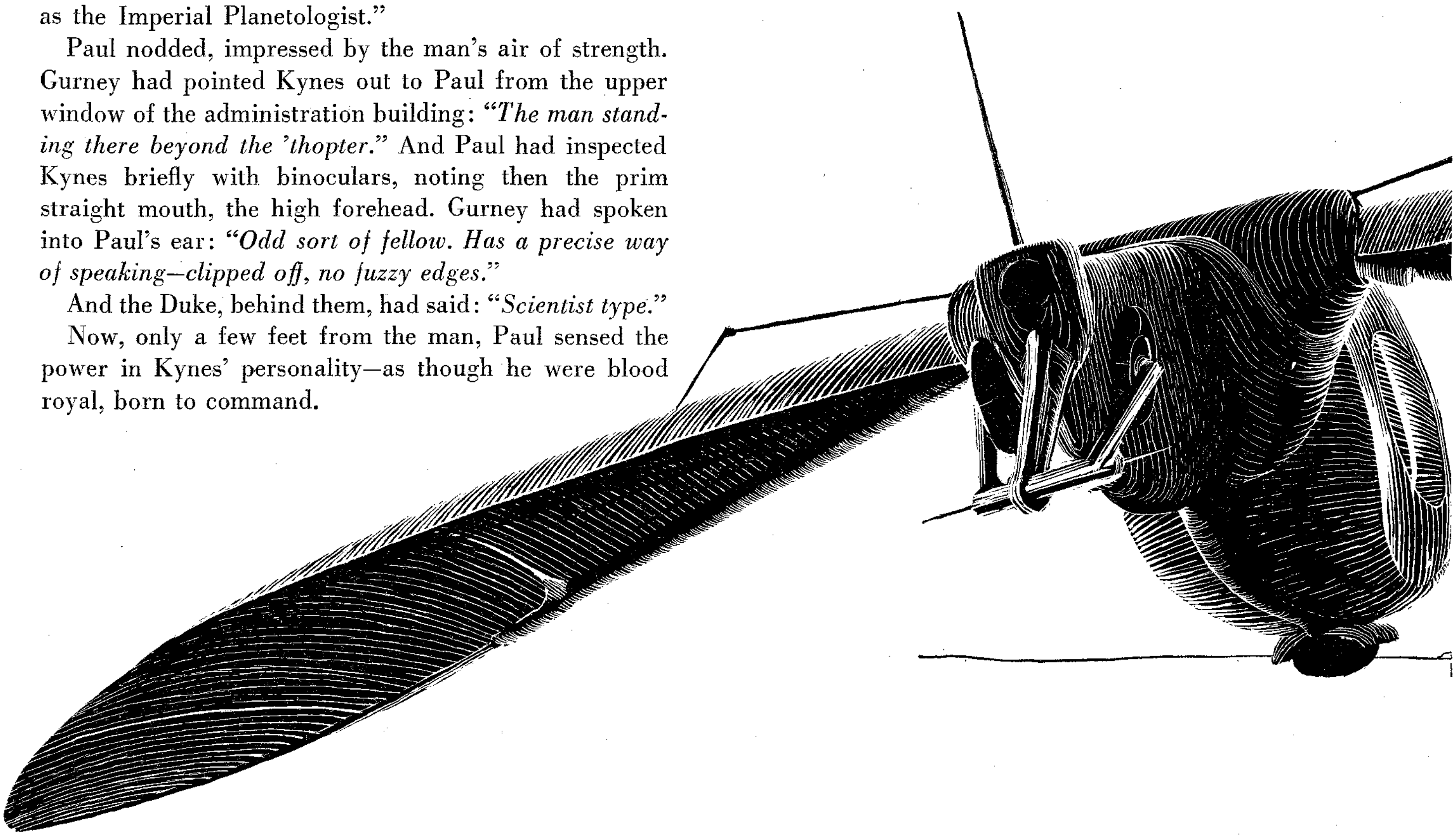
Leto gave Halleck their private hand signal to desist, said: "Our ways are new here, Gurney. We must make allowances."

Halleck nodded. "As you wish, sire."

"We are indebted to you, Dr. Kynes," Leto said. "These suits and the consideration for our welfare will be remembered."

On impulse, Paul called to mind a quotation from Yueh's OC Bible, said: "The gift is the blessing of the giver."

The words rang out overloud in the still air. Kynes' Fremen guard in the shade of the administration building leaped up from their squatting repose, muttering in open agitation. One cried out: "Lisan al-Gaib!"



Kynes whirled, gave a curt, chopping signal with his hand, waved the guard away. They fell back slowly, grumbling among themselves.

"Most interesting," Leto said.

Kynes passed a hard glare over the Duke and to Paul, said: "Most of the desert natives here are a superstitious lot. Pay no attention to them. They mean no harm." But he thought of the words in the legend: *"They will greet you with Holy Words and your gifts will be a blessing."*

Leto had formed an opinion about Kynes, based partly on Hawat's brief verbal report—guarded and full of suspicions — but mostly on observing him. Kynes had come with a Fremen guard. That, of course, could mean merely that the Fremen were testing their new freedom to enter the urban areas, but the Duke thought not. It had seemed an honor guard. And Kynes, by his manner, was a proud man, accustomed to freedom—his tongue and his manner guarded by his own suspicions. Paul's question had been direct and pertinent—the man *was* a Fremen.

"Should we be going, sire?" Halleck asked.

"Yes." The Duke nodded. "I'll fly my own 'thopter. Kynes can sit up front with me to direct me. You and Paul take the rear."

"One moment, please," Kynes said. "With your permission, sire, I'd like to inspect the security of your suits." As the Duke started to speak, Kynes pressed on: "I have concern for my own flesh as well as yours . . . My Lord. I'm well aware of whose throat would be slit should anything happen to you in my care."

The Duke smiled, thinking: *How delicate this moment! If I refuse, it may offend him. And I suspect that this is a man whose value to me is beyond measure. Yet . . . inside my shield, touching me when I know so little of him?*

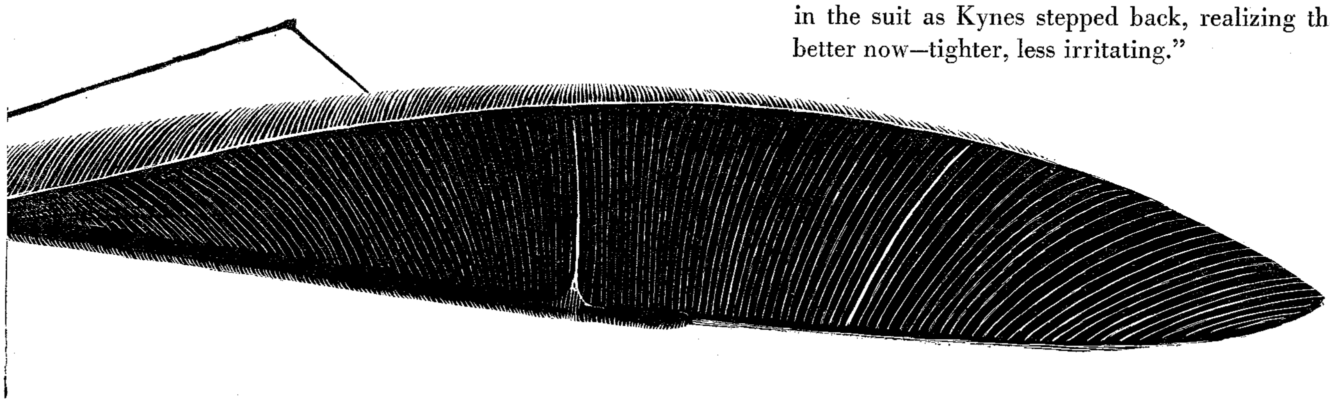
The thoughts flicked through his mind with decision hard on their heels. "We are in your hands," the Duke said. He stepped forward, opening his robe, saw Halleck stiffen but remain where he was. "And, if you would be so kind," the Duke said, "I'd appreciate an explanation of the suit from one who lives so intimately with it."

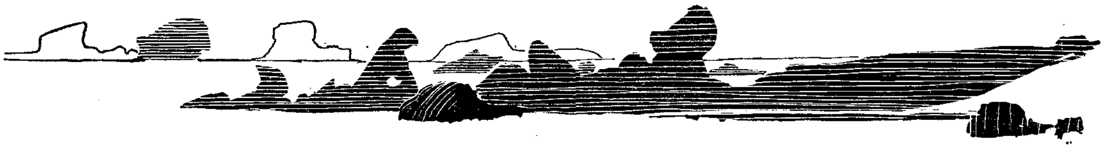
"Certainly," Kynes said. He felt up under the robe for the shoulder seals, speaking as he examined the suit. "It's basically a micro-sandwich—several layers." He adjusted the shoulder seals. "The skin layer's porous. Perspiration passes through it, having cooled the body. The next two layers include heat-exchange filaments and salt precipitators. The salt's reclaimed."

The Duke lifted his arms at a gesture from Kynes, nodded.

Kynes studied the underarm seals, adjusted one. "Motions of the body," he said, "and osmotic action provide the pumping force. The reclaimed water circulates to catchpockets from which you may draw it by that tube at your neck." He knelt, examined the leg seals. "Urine and feces are processed in the thigh pads." He stood up, felt the neck, lifted a flap section there. "In the open desert you wear this filter across your face, this tube in the nostrils. Breathe in through the mouth filter, out through the nose tube. With a Fremen suit in good working order, you won't lose more than a thimbleful of moisture a day—even if you're caught in the Great Erg." Kynes pressed a finger against the forehead pad of the suit, said: "This may rub a little. If it does, please tell me. I could slit-patch it a bit tighter."

"My thanks," the Duke said. He moved his shoulders in the suit as Kynes stepped back, realizing that it felt better now—tighter, less irritating."





Kynes had turned to Paul, saying: "Now for you lad."

*A good man but he'll have to learn to address us properly,* the Duke thought.

Paul stood passively as Kynes inspected the suit. It had been an odd sensation putting on the enclosing garment. In his foreconsciousness was the absolute knowledge that he had never before worn a stillsuit. Yet, each motion of adjusting the adhesion tabs under Gurney's inexpert guidance had seemed natural, instinctive. When he had tightened the chest fit to gain maximum pumping action from his breathing, he had known what he was doing and why. When he had fitted neck and forehead tabs tightly, he had known it was to prevent friction blisters.

Kynes straightened, stepped back from Paul with a puzzled expression. "You've worn a stillsuit before, Young Master?" he asked.

"No . . . this is the first time."

"Then someone adjusted it for you?"

"No."

"Your desert boots are fitted slip-fashion at the ankles. Who told you to do that?"

"It . . . seemed the right way."

"That it most certainly is."

Kynes swallowed, thinking of the legend: *"He shall know your ways as though born to them."*

"We waste time," the Duke said. He gestured toward the waiting 'thopter, turned and led the way, accepting the guard's salute with a casual nod. He climbed in, fastened his safety belt, checked the controls and instruments. The craft creaked as the others clambered aboard.

Kynes, fastening his belt, focused as always on the padded comfort of such aircraft—the soft luxury of gray-green upholstery on seats and ceiling and walls, the gleaming instruments, the feeling of filtered air in his lungs as the doors were slammed and the vent fans whirred alive.

*So soft!* he thought.

"All secure, sire," Halleck said.

Leto fed power to the wings, felt them cup and dip—once, twice. They were airborne within ten meters, wings feathered tightly and afterjets thrusting them up in a steep, hissing climb.

"Southeast over the Shield Wall," Kynes said. "That's where I told your man Idaho to concentrate his equipment."

The Duke nodded, banked into his air cover. The other craft took up position around them as they headed southeast.

"The design and manufacture of these stillsuits bespeaks a high degree of sophistication," the Duke said.

"Some day, perhaps I'll show you one of the *sietch* factories," Kynes said.

"I'd enjoy that," the Duke said. "I note that they make them in some of the cities and villages, too."

"Inferior copies," Kynes said. "Any Dune man who values his skin wears a Fremen suit."

"And you can hold your water loss to a thimbleful a day?"

"Properly suited and with your forehead cap tight, your major water loss is through the palms of your hands," Kynes said. "You can wear gloves if you're not using your hands for any critical work, but most Fremen in the open desert rub their hands with juice from the leaves of the creosote bush. It inhibits perspiration."

The Duke glanced down to the left at the broken landscape of the Shield Wall—chasms of tortured rock, patches of yellow-brown crossed by black lines of fault shattering as though someone had dropped this ground from space and left it where it smashed. They crossed a shallow basin with the clear outline of gray sand spread across it from a canyon opening to the south. The sand fingers ran out into the basin, a dry delta outlined against the darker rock.

Kynes thought about the water-fat flesh he had felt beneath the stillsuits as he examined them. They wore shield belts over their robes, slow pellet stunners at the waist, coin-sized emergency transmitters on cords around their necks. And both the Duke and his son carried knives in wrist sheaths. These people were a strange combination of softness and armed strength.

"When you report to the Emperor on the changeover of Arrakis, will you say we observed the rules?" Leto asked. He glanced at Kynes, back to their course.

"The Harkonnens left; you came," Kynes said.

"And is everything as it should be?" Leto asked.

A momentary tenseness showed in the tightening of a muscle along Kynes' jaw. "As Planetologist here, I am a direct subject of the Imperium . . . My Lord."

The Duke smiled grimly. "But we both know the realities."

"I remind you that His Majesty supports my work."

"Indeed? And what is your work?"

In the brief silence, Paul thought: "He's pushing this Kynes too hard. Paul glanced at Halleck, but the minstrel-warrior was staring out at the barren landscape.

Kynes spoke stiffly: "My work is mostly dry land biology and botany . . . some geological work—core drilling and testing. You never really exhaust the possibilities of an entire planet."

"Do you also investigate the spice?"

Kynes turned, and Paul noted the hard line of the man's jaw. "A curious question, My Lord."

"I want you to bear in mind, Kynes, that this is now my fief. My methods differ considerably from the Harkonnens. I do not care if you study the spice. You may now do openly what you no doubt have been doing secretly all along under the Harkonnens." The Duke glanced at Kynes. "They discouraged investigation of the spice, did they not?"

Kynes stared at him without answering.

"Another difference," the Duke said: "You may speak plainly to me on subjects that might displease me, yet have no fear for your skin."

"The Imperial court is, indeed, a long way off," Kynes muttered. And he thought: *What does this water-soft in-*

*vader expect of me? Does he think me fool enough to enlist with him?*

The Duke chuckled, keeping his attention on their course. "I detect a sour note in your voice, sir. We've waded in here with our mob of tame killers, eh? And we expect you to realize immediately that we're different from the Harkonnens?"

"You're different, all right," Kynes said. "You've filled *sietch* and village with your propaganda—'Love the good Duke!' Your corps of—"

"Here now!" Halleck barked. He snapped his attention away from the window, leaned forward.

Paul put a hand on Halleck's arm.

"Gurney!" the Duke said. He glanced back. "This man's been long under the Harkonnens. Remember that."

Halleck sat back. "Ayah."

"And the pattern's familiar," Kynes said. "You've put your pressures on me. Your man Hawat is subtle, but his object's plain enough."

"Will you open those bases to us, then?" the Duke asked.

Kynes spoke curtly: "They're His Majesty's property."

"They're not being used."

"They could be used, though," Kynes said, and his voice dripped acid. "They could be used to help make an Eden out of Arrakis, not just to grub more money out of the spice."

The Duke mulled the implications in this outburst, said: "How is a planet to become an Eden without money?"

"What is money?" Kynes asked, "if it will not buy the services you need?"

*Ah, now!* the Duke thought. He said: "We will discuss this another time. Right now, I think we're nearing the end of the Shield Wall. Do I hold the same course?"

"The same course," Kynes muttered.

Paul looked out his window. Beneath them, the broken ground began to drop away in tumbled creases toward a barren rock plain and a knife-edged shelf. Beyond the shelf the fingernail crescents of dunes marched toward the horizon with here and there in the distance a dull smudge, a darker blotch to tell of something not sand. Rock outcroppings, perhaps. In the heat-addled air he couldn't be sure.

"Are there any plants down there?" Paul asked.

"Some," Kynes said. "This latitude's 'life zone' has mostly what we call minor water stealers—adapted to raiding each other for moisture, gobbling up the trace-dew. Some parts of the desert teem with life. But all of it's life that has learned how to survive under these rigors. If *you* get caught down there on the surface, you must imitate that life or die."

"You mean steal water from each other?" Paul asked. The idea outraged him, and his voice betrayed the emotion.

"It is done," Kynes said, "but that wasn't precisely my meaning. You see, my climate demands a special attitude toward water. You are aware of water at all times. You waste nothing that contains moisture."

And the Duke thought: ". . . *My climate!*" Kynes was a proud, possessive man.

"Come around two degrees more southerly, My Lord," Kynes said. "There's a blow coming up from the west."

The Duke nodded. He had seen the billowing of tan dust there. He banked the 'thopter around, noting the way the escort's wings reflected milky orange from the dust-refracted light as they turned to keep pace with him.

"This will clear the storm's edge," Kynes said.

"That sand must be dangerous if you fly into it," Paul said. "I'm told it cuts the strongest metals."

"At this altitude, it's not sand but dust," Kynes said. "The danger is blindness, turbulence, the clogging of intakes."

"We'll see actual spice mining today?" Paul asked.

"Very likely," Kynes said.

Paul sat back. He had been using the questions with all his senses to do what his mother called "registering" the person. He had Kynes registered now—the tone of the voice, each detail of face. An unnatural folding of the left sleeve on the man's robe told of a knife in an arm sheath. The waist bulged strangely. It was said the desert men wore a belted sash into which they tucked small necessities. Perhaps the bulges came from such a sash. A copper pin engraved with the likeness of a hare clasped the neck of Kynes' robe. Another smaller pin with similar likeness hung at the corner of the thrown-back hood, ready to fix the hood in place with veil across the lower half of the face.

Halleck twisted in the seat beside Paul, reached back into the rear compartment and brought out his baliset. Kynes looked around as Halleck tuned the instrument, then turned back to keep his attention on their course.

"What would you like to hear, young master?" Halleck asked.

"I don't care, Gurney," Paul said.

Halleck bent his ear close to the sounding board, strummed a chord and sang softly:

*"Our fathers ate manna in the desert,*
*"In the burning places where whirlwinds came.*
*"Lord, save us from that horrible land!*
*"Save us . . . ohhhh, save us*
*"From the dry and thirsty land."*

Kynes glanced at the Duke, said: "You *do* travel with a light complement of guardsmen, My Lord. Are all your guards such men of many talents?"

"Gurney?" The Duke chuckled. "Gurney is one of a kind. I like him with me for his eyes, too. His eyes miss very little."

The planetologist frowned.

Without missing a beat in his tune, Halleck interposed:

*"For I am like an owl of the desert, o!*
*"Aiyah! am like an owl of the desert!"*

The Duke reached down, brought up the communinet microphone from the instrument panel, thumbed it to life, said: "Leader to Escort Gemma. Flying object at nine o'clock, sector B. Do you identify it?"

"It is merely a bird," Kynes said, and added: "You have sharp eyes."

The panel speaker crackled, then: "Escort Gemma. Object examined under full amplification. It's a bird."

Paul, looking in the indicated direction, saw the distant speck—a dot of intermittent motion—and realized how keyed up his father must be. Every sense was at full alert.

"I'd not realized there were birds that large this far into the desert," the Duke said.

"That is likely an eagle," Kynes said. "Many creatures have adapted to this heat."

"How hot does it get down on the surface of the desert?" Paul asked.

The Duke nodded. The question had been poised on his own lips.

Kynes shrugged. "Heat is relative. There are climates within climates. You have the microclimate of a dune where it may be a hundred degrees hotter on the surface than it is one foot into the sand. Black shade can reduce the heat by as much as forty degrees. Half a meter above the sand it can be twenty degrees cooler than on the surface."

The ornithopter swept over a bare rock plain. Paul looked down from their two thousand meters' altitude, saw the wrinkled shadows of their craft and the escort. The land beneath them seemed flat, but shadow wrinkles said otherwise.

"Has anyone ever walked out of the desert?" the Duke asked.

Halleck's music stopped. He leaned forward to hear the answer.

"Not from the deep desert," Kynes said. "Men have walked out of the second zone several times. They've survived by crossing the rock areas where the worms do not go."

The timbre of Kynes' voice held Paul's attention. He felt his senses come alert the way they were trained to do.

"Ahh, the worms," the Duke said. "I must see one sometime."

"You may see one today," Kynes said. "Wherever there is spice there are worms."

"Always?" Halleck asked.

"Always."

"You may speak frankly with us," the Duke said. "What is the relationship between worms and the spice?"

Kynes turned and Paul saw the pursed lips as the man spoke. "They defend spice *sands*. Each worm has a . . . territory. As to the spice—who knows? Worm specimens we've examined lead us to suspect complicated chemical interchanges within them. The canal is lined with gigantic cilia, each backed by a duct. We find traces of hydrochloric acid in the ducts, more complicated acid forms elsewhere. I'll give you a copy of my monograph on the subject."

"A man with a shield would have an advantage, of course, if one attacked him," the Duke said.

"Shields!" Kynes sneered. "Activate a shield within the zone of worms and you seal your fate. Worms will ignore territory lines, come from all around to attack a shield. And no man wearing a shield has ever survived such an attack."

*Is that why the desert folk wear no shields?* the Duke wondered.

"High voltage electrical shock applied separately to each ring is the only known way of killing and preserving an entire worm," Kynes said. "They can be stunned by explosives, but each ring segment has a life of its own. Outside of atomics, I know of no explosive powerful enough to destroy an entire worm. They're incredibly tough."

And the Duke thought: They may be tough, yet they're only *nonsentient creatures. A way can be found.*

"Why hasn't an effort been made to wipe them out?" Paul asked.

"It couldn't be done," Kynes said. "Too much area to cover, too expensive."

Paul leaned back in his corner. His special truthsense, the awareness of tone shadings, told him that Kynes was lying and telling half-truths. And he thought: *If there's some relationship between worms and spice, killing all the worms could destroy the spice.*

"Well, no one has to walk out of the desert," the Duke said. "Just trip these little transmitters at our necks, and rescue is on its way. All our workers will be wearing them before long. We're setting up a special rescue service."

"Very commendable," Kynes said.

"Your tone says you don't agree with this action," the Duke said.

"Agree? Certainly I agree, but it will not be much use. Static electricity from sandstorms masks out many signals, shorts out the transmitters. They've been tried before, you know. If a worm is hunting you, there's not much time. Frequently, you have no more than fifteen or twenty minutes."

"What would you advise?" the Duke asked.

"You ask me to advise?"

"I do."

"You would follow my advice?"

"If I found it sensible."

"Very well, My Lord. Never travel alone."

The Duke turned his attention from the controls. "That's all?"

"Never travel alone."

"What if you're separated by a storm and then forced down," Halleck asked. "Isn't there anything you could do?"

"*Anything* covers much territory," Kynes said.

"What would *you* do?" Paul asked.

Kynes turned a hard stare at the boy, brought his attention back to the Duke. "I? I would remember to protect the integrity of my stillsuit. If I were outside the worm zone or in rock, I'd stay with the ship. If I were down in open sand, I'd get away from the ship as fast as I could, walking softly. About a thousand meters should be far enough. Then I'd shield myself beneath my robe, blend into the landscape. A worm would get the ship, but it might miss me. I am smaller. The body does not generate as large an electrical field."

"Then what?" Halleck asked.

Kynes shrugged. "Wait for the worm to leave."

"That's all?" Paul asked.

"When the worm has gone, one may try to walk out," Kynes said. "You must walk softly, avoid drum sands, the tidal dust basins—head for the nearest rock zone. There are many such zones. You might make it to one."

"Drum sand?" Halleck said.

"An anomaly of sand compaction," Kynes said. "The slightest step upon it can set it to drumming. Worms always come to such drumming. The sound will travel for tremendous distances."

"What is a tidal dust basin?" the Duke asked.

"Certain depressions in the desert—basins, ravines and such—have been filled with dust over the centuries. Some are so vast they have actual currents and tides. All will swallow the unwary who step into them."

Halleck sank back, resumed strumming the baliset. Presently, he began singing in a minor key:

*"Wild beasts of the desert do hunt there,*
*"Waiting for the innocents to pass.*
*"Ohhh, tempt not the gods of the desert,*
*"Lest you seek a lonely epitaph.*
*"The perils of the . . ."*

He broke off, leaned forward. "There is a dust cloud ahead, sire."

"I see it."

"That's what we seek," Kynes said. He nodded toward a rolling yellow cloud low on the desert surface, still some thirty kilometers ahead. "One of your factory crawlers. It's on the surface and that means it's on spice. The cloud is vented sand being expelled after the spice has been centrifugally removed. There is no other cloud quite like that one."

"Aircraft over it," the Duke said.

"I see two . . . three . . . four spotters," Kynes said. "They're looking for wormsign."

"Wormsign?" the Duke said.

"A sand ripple moving toward the crawler. They'll have seismic probes on the surface, too. Some worms travel too deep for the ripple to show." Kynes swung his gaze across the sky. "There should be a carryall wing around—the craft that brings in the factory crawler and retrieves it when the worm comes."

"They always come, eh?" Halleck asked.

"Always."

Paul leaned forward, tapped Kynes on the shoulder. "How big an area does each worm stake out?"

Kynes frowned. The child kept asking adult questions.

"That depends on the size of the worm."

"What's the variation?" the Duke asked.

"A big one may control three or four hundred square kilometers. A small one . . ." He broke off as the Duke kicked on the jet brakes. The ship bucked as its tail pods whispered to silence. Stub wings elongated, cupped the air. The craft became a full 'thopter as the Duke banked it, holding the wings to a gentle beat, pointing with his left hand off to the east beyond the factory crawler. "Is that wormsign?"

Kynes leaned across the Duke to peer into the distance. Paul and Halleck were crowded together, looking in the same direction. Paul noted that their escort, caught by the sudden maneuver, had surged ahead, but now were curving back. The factory crawler was about three kilometers ahead.

Where the Duke pointed, crescent dune tracks spread their shadow ripples toward the horizon and, running through them as a level line stretching into the distance, came an elongated mound in motion—a cresting of the sand. It reminded Paul of the way a big fish disturbed the water when swimming just under the surface.

"Worm," Kynes said. "Big one." He leaned back, grabbed the microphone from the panel, punched out a new frequency selection. Glancing at a grid chart on rollers over their heads, he spoke into the microphone: "Calling crawler at Delta Ajav niner. Wormsign warning. Crawler at Delta Ajax niner. Wormsign warning. Come in, please." He waited.

The panel speaker emitted static crackles, then a voice: "Who calls Delta Ajax niner? Over."

"They seem pretty calm about it," Halleck said.

Kynes spoke into the microphone: "This is an unlisted flight. We're north and east of you about three kilometers. Wormsign is on intercept course your position, estimated contact twenty-five minutes."

Another voice came out of the speaker: "This is Spotter Control. Sighting is confirmed. Standby for a contact fix." There was a pause, then: "Contact in twenty-six minutes. That was a sharp estimate. Who's on that unlisted flight? Over."

Halleck surged forward between Kynes and the Duke. "Is this the regular working frequency, Kynes?"

"Why . . . yes, but—"

"Who'd be listening to it?"

"Just the work crews in this area. Cuts down interference."

Again the speaker crackled, then: "This is the crawler. Who gets the credit bonus for that spot? Over."

Halleck glanced at the Duke.

Kynes said: "There's a bonus based on the crawler's spice load for whoever gives first warning on a worm. They want to know—"

"Tell them who had first sight of that worm," Halleck snapped.

The Duke nodded.

Kynes lifted the microphone. "Credit the sighting to the Duke Leto Atreides. Do you read? Credit the sighting to the Duke Leto Atreides. Over."

The voice from the speaker was flat and partly distorted by a burst of static. "We read and thank you."

"Now, tell them to divide the bonus among themselves," Halleck ordered. "Tell them it's the Duke's wish."

Kynes took a deep breath, then with mouth close to the microphone: "It is the Duke's wish that you divide the bonus among yourselves. Do you read? Over."

"Acknowledged and thank you," the speaker said.

The Duke spoke dryly: "I forgot to mention that Gurney is also very talented in public relations."

Kynes turned a puzzled frown on Halleck.

"This lets the men know their Duke's watching over them," Halleck said. "Word will get around. It was done on an area working frequency—not likely any Harkonnen agents heard." He glanced out the window at their cover. "And we're a pretty strong force. It's a good risk."

The Duke banked their craft toward the sandcloud erupting from the factory crawler. "What happens now?"

"There's a carryall wing somewhere close," Kynes said. "It'll come down now and lift off the crawler."

"What if something goes wrong with the carryall?" Halleck asked.

"A certain amount of equipment *is* lost," Kynes said. "Get in close over them, My Lord; you'll find this interesting."

The Duke scowled, busied himself with the controls as they came into turbulent air over the crawler. Sand still spewed out of the metal and plastic monster beneath them. It looked like a great beetle with many wide tracks extending on arms around it. They could see a giant inverted funnel snout poked into the sand in front of it, a darker tone to the desert surface there.

"They're on a rich spice bed by the color of it," Kynes said. "They'll continue working it until the last minute."

The Duke fed more power to the wings, then stiffened them for a steeper descent as he settled lower in a circling glide above the crawler.

Paul peered down out his window at the tan and blue machine creeping over the sand, noting the yellow cloud belching from the pipe vents.

"Shouldn't we be hearing them ask for their carryall?" Halleck asked.

"They usually have the wing on a different frequency," Kynes said.

"I don't see any sign of a carryall," Halleck said.

"Shouldn't they have two carryalls standing by for every crawler?" the Duke asked. "There are twenty-six men on that machine down there, not to mention the cost of equipment."

Kynes said: "There'll be—"

The speaker erupted with an angry voice: "Any of you see the wing? He isn't answering my call."

There was a garble of noise from the speaker, then an override signal, silence, and the first voice: "Report by the numbers! Over."

"This is spotter control. Last I saw of the wing, he was up pretty high and just circling off to the northwest of us. I don't see him now. Over."

"Spotter one: negative. Over."

"Spotter two: negative. Over."

"Spotter three: negative. Over."

Silence.

The Duke looked down. The shadow of his own craft was just passing across the crawler. "I count four spotters. That right?"

"Correct," Kynes said.

"There are five of us," the Duke said. "Our ships are larger. We can crowd in three extras to each ship. Their spotters ought to be able to take two each."

Paul did the mental arithmetic, said: "That's three short."

"Why don't they have two carryalls on each crawler?" barked the Duke.

"You don't have that much equipment to spare, My Lord," Kynes said.

"All the more reason we should protect what we have!" The Duke reached out, grabbed the microphone.

Halleck asked: "Where could a carryall go?"

"Could've been forced down somewhere out of sight," Kynes said.

The Duke hesitated with the microphone at his mouth, thumb poised over the switch. "How could they lose sight of the carryall?" he demanded.

"They probably were keeping their attention focused on the ground, watching for wormsign," Kynes said.

The Duke pressed the switch, spoke into the microphone: "We are coming down to take off the crew. This is your Duke. We are coming down to take off the crew. All spotters are ordered to comply." He reached down, punched his own command frequency, repeated the order for his air cover, handed the microphone back to Kynes.

Kynes returned to the working frequency and a voice erupted from the speaker. ". . . Almost a full load of spice! We have almost a full load! We can't leave that for the worm! Over."

"Damn the spice!" the Duke snapped. He grabbed back the microphone, barked into it: "We can always get more spice. There are seats in our ships for all but three of you. Draw straws or decide any way you like who's to go. We are coming down to get you. That's an order!" He slammed the microphone back into Kynes' hands, muttered: "Sorry," as Kynes shook an injured finger.

"How much time?" Paul asked.

"Nine minutes," Kynes said.

The Duke said: "This ship has more power than our others. If we took off under jet with three-quarter wings, we could crowd in an additional man."

"That sand is soft," Kynes said.

"With four extra men aboard on a jet takeoff, we could snap the wings, sire," Halleck said.

"Not on this ship if it's handled correctly," the Duke said. He hauled back on the controls. The wings tipped up, braked the 'thopter to a skidding stop within ten meters of the crawler.

The big machine was still now, no sand spouting from its vents. Only a faint mechanical rumble issued from it.

The Duke opened his door.

Immediately, their nostrils were assailed by the odor of cinnamon—heavy and pungent.

With a loud flapping, the spotter aircraft glided down to the sand on the other side of the crawler. The Duke's own escort swooped in to land around the factory. All were dwarfed by it—gnats beside a warrior beetle.

"Gurney, you and Paul toss out that rear seat," the Duke ordered. He manually cranked the wings out to three-quarters, set their angle, checked the jet pod controls. "Why the devil aren't they coming out of that machine?"

"They're hoping the carryall will show up," Kynes said. "They still have a few minutes." He glanced off to the east.

All turned to look in the same direction, saw no sign of the worm, but there was a heavy, charged feeling of anxiety in the air.

The Duke took the microphone, punched for his command frequency, said: "Two of you toss out your shield generators. By the numbers. You can carry one more man off that way. We're not leaving any men for that monster." He keyed back to the working frequency, barked: "All right, you in the crawler! Out! Now! This is a command from your Duke, and the devils will get any man who disobeys it!"

A hatch snapped open near the front of the crawler, another at the rear, another at the top. Men came tumbling out, sliding and scrambling down to the sand. A tall man in a patched working robe was the last to emerge. He jumped down to a track and then to the sand.

The Duke hung the microphone on the panel, swung out the door onto the wing step, shouted: "Two men each into those spotters."

The last man out began tolling off pairs of men, pushing them toward the craft waiting on the other side of the crawler.

"Four over here!" the Duke shouted. "Four into that ship there!" He jabbed a finger at an escort 'thopter directly behind him. The guards were just wrestling the shield generator out of it. "And four into that ship over there!" He pointed to the other escort that had shed its shield generator. "Three each into the others! Run, you sand hogs!"

The tall man finished counting off his crew, came slogging across the sand followed by three of his companions.

"I hear the worm," Kynes said, "but I can't see it."

The others heard it then—an abrasive slithering, distant and growing louder.

"Sloppy way to operate," the Duke muttered.

Aircraft began flapping off the sand around them. It reminded the Duke of a time in his home planet's jungles, a sudden emergence into a clearing, and carrion birds lifting away from the carcass of a wild ox.

The men slogged up to the side of the ship, started climbing in behind the Duke. Halleck helped them, dragging them back into the rear.

"In you go, boys!" he snapped. "On the double!"

Paul, crowded into a corner by sweating men, smelled the perspiration of fear, saw that two of the men had sloppy neck adjustments on their stillsuits. He filed this information in his mind for future action. His father would have to order tighter stillsuit discipline. Men tended to become lax if you didn't watch such things.

The last man came gasping into the rear, said: "The worm! It's almost on us! Blast off!"

The Duke slid into his seat, frowning, said: "We still have almost five minutes on the original estimate. Is that right, Kynes?" He shut his door, checked it.

"Almost exactly, My Lord," Kynes said, and he thought: *A cool one, this Duke.*

"All secure here, sire," Halleck said.

The Duke nodded, watched the last of his escort take off, adjusted the igniter, glanced once more at wings, instruments, punched the jet throttle.

The take-off thrust the Duke and Kynes into their seats, compressed the people in the rear. Kynes watched the way the Duke handled the controls—gently, surely. They were fully airborne now, and the Duke studied his instruments.

"She's very heavy, sire," Halleck said.

"But well within the tolerances of this particular ship," the Duke said. "You didn't really think I'd risk this cargo, did you Gurney?"

Halleck grinned, said: "The idea crossed my mind, sire, but I rejected it."

In a long, easy curve, the Duke banked his craft around, climbing over the crawler. He looked down.

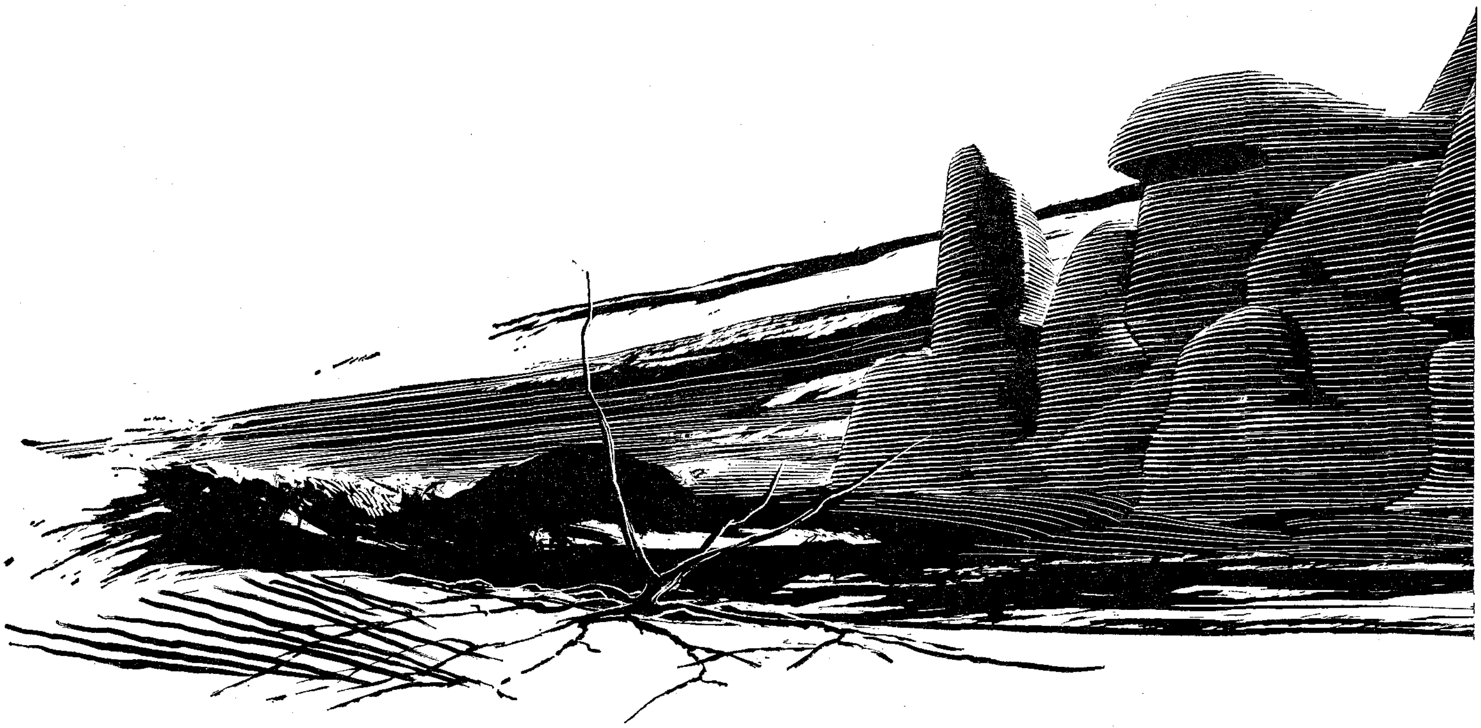
Paul, crushed against a wall beside a window, stared down at the scene which held his father's attention. The wormsign had broken off about three hundred meters from the crawler. There appeared to be turbulence in the sand around the factory, though.

"The worm is now beneath the crawler," Kynes said. "You are about to see something interesting."

Flecks of dust shadowed the sand around the crawler, now. The big machine began to tip down to the right. A gigantic sand whirlpool began forming to the right of the crawler. It moved faster and faster. Sand and dust filled the air for hundreds of meters around.

Then they saw it!

A gigantic hole emerged from the sand. Sunlight flashed from sharp spokes of white within it. The hole's diameter was at least twice the length of the crawler. The machine slid into the opening in a billowing of dust and sand, and the hole pulled back.



"Gods, what a monster!" muttered a man beside Paul.

"Got all our floggin' spice!" growled another.

"You'll not lose anything by this," the Duke said. "I'll make up the loss myself. But *someone* is going to pay for it. I promise you that."

In the very flatness of his father's tone Paul sensed a deep anger. He found that he shared it. This thing was stupid, criminal!

"*Someone* will pay," the Duke said.

In the silence that followed, they heard Kynes.

"Bless the Maker and His water," Kynes murmured. "Bless the coming and going of Him. May His passage cleanse the world. May He keep the world for His people."

"What's that you're saying?" the Duke asked.

But Kynes remained silent.

Paul glanced at the men crowded around him. They were staring fearfully at the back of Kynes' head. One of them whispered: "*Liet.*"

Kynes turned, scowling. The man sank back, abashed.

Another of the rescued men began coughing—dry and rasping. Presently, he gasped: "Curse the day I came to this hell hole!"

The tall Dune man who had come last out of the crawler said: "Be you still, Coss. You but worsen your cough." He stirred among the men until he could look through them at the back of the Duke's head. "You be the Duke Leto, I warrant," he said. "It's to you we give our thanks for our lives."

"Quiet, man, and let the Duke fly his ship," Halleck muttered.

And Paul glanced at Halleck. He, too, had seen the tension wrinkles at the corner of his father's jaw. One walked softly when the Duke was in a rage.

The Duke began easing his ornithopter out of its great banking circle, then stopped at a new sign of movement on the sand. Now that the worm had withdrawn into the depths beneath where the crawler had been, two figures could be seen moving north away from the depression in the sand. They appeared to glide over the surface with hardly a lifting of dust to mark their passage.

"Who's that down there?" the Duke barked.

"Those be two Johnnies who came along for the ride, soor," said the tall Dune man.

"Why didn't someone say something about them?"

"It was the chance they took, soor," the Dune man said.

"My Lord," Kynes said, "these men know it's of little use to do anything about a man trapped on the desert in worm country."

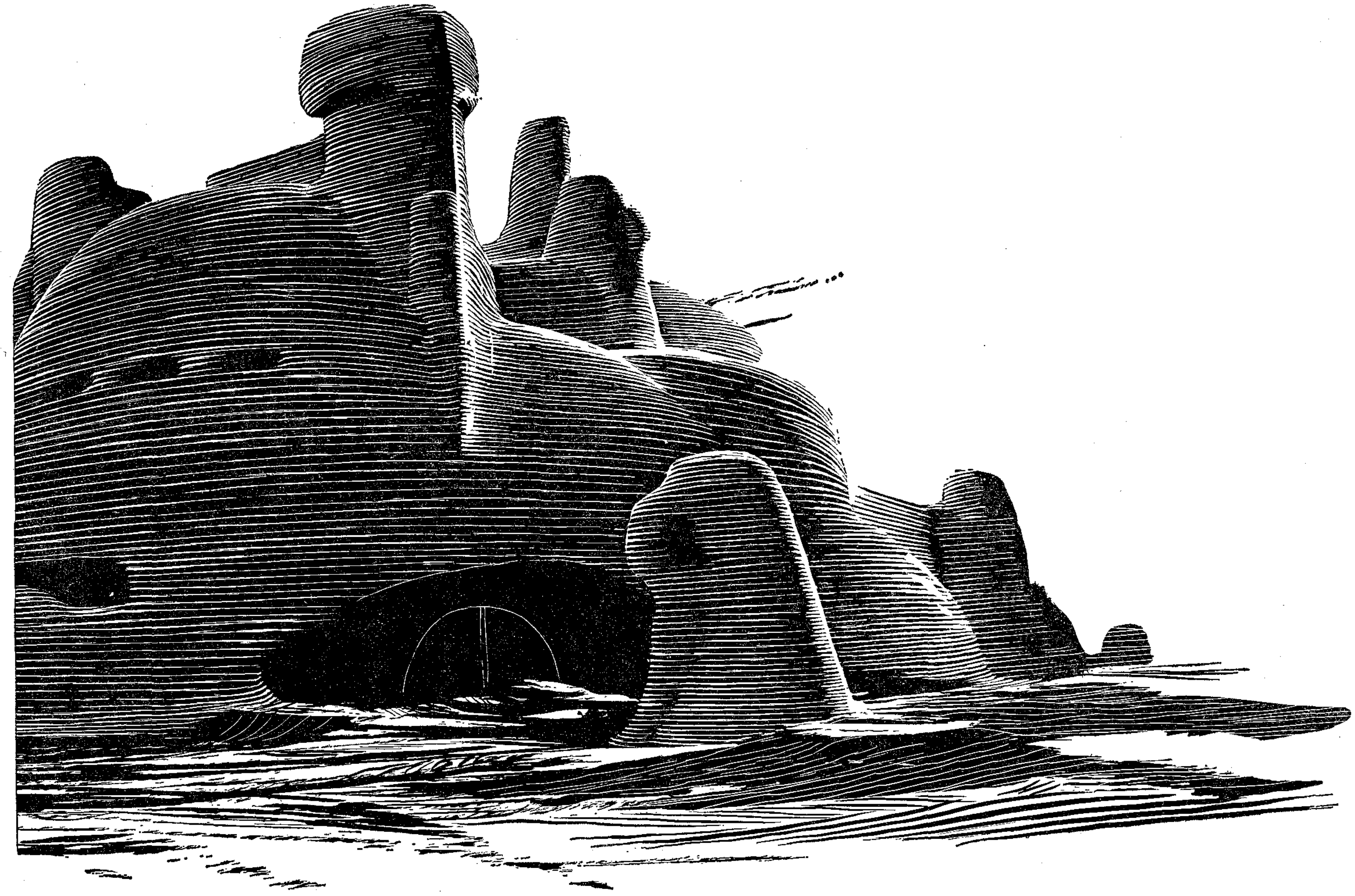
"We'll send another ship back for them!" the Duke snapped.

"As you wish, My Lord," Kynes said. "But likely when the rescuer returns there'll be no one to rescue."

"We'll send a ship anyway," the Duke said. "We have the co-ordinates of this place."

"You waste fuel here, sire," Halleck said.

"Right you are, Gurney."



The Duke brought his craft around in a course toward the Shield Wall. His escort came down from circling stations, took up positions above and on both sides.

Paul thought about what Kynes had said. The man had been lying, no doubt of it. Why had he lied about the two men on the desert. And the Dune man here—Paul hadn't heard enough of his voice to be sure, but there was a note of concealment in it.

The men had glided across the sand so surely, moving in a way obviously calculated to keep from luring the worm out of the depths. They had—

*Fremen!* Paul thought. *They live in the desert and around it. Who else would be so sure on the sand? Who else might be left out of your worries as a matter of course —because* they *are in no danger?* They *know how to live here!* They *know how to outwit the worm!*

"What were Fremen doing on that crawler?" Paul asked.

The tall Dune man turned wide eyes on Paul—blue within blue within blue. "Who be this lad?" he asked.

Halleck moved to place himself between the men and Paul, said, "This is Paul Atreides, the ducal heir."

"Why says he there were Fremen on our rumbler?" the man asked.

"They fit the description," Paul said.

Kynes snorted. "You can't tell a Fremen just by looking at him!" He looked at the Dune man. "You. Who were those men?"

"Friends of one of the other men," the Dune man said. "Just friends from a village who wanted to see the spice sands."

Kynes turned away ."Fremen!"

"And they be dead now, most likely, young soor," the Dune man said. "We should not speak unkindly on them."

But Paul heard the falsehood in their voices, felt the menace that had brought Halleck into guarding position instinctively.

Paul spoke dryly: "A terrible place for them to die."

Without turning, Kynes said: "When God hath ordained a creature to die in a particular place, he causeth that creature's wants to direct him to that place."

Leto turned a hard stare on Kynes.

And Kynes, returning the stare, found himself troubled by only one fact out of this incident in the sands: *This Duke was concerned much more over his men than he was over the spice. He had passed off the loss of a crawler with a gesture. The threat to men's lives had him in a rage. A man such as that could command fanatic loyalty. He would be difficult to defeat.*

## XVI

*Greatness is a transitory experience of the individual. It is never consistent, and depends in part upon the myth-making imagination of humankind. The person who experiences greatness must have a feeling for the myth he* *is in. He must reflect what is projected upon him. And he must have a strong sense of the sardonic. This is what uncouples him from belief in his pretensions. The sardonic is all that permits him to move within himself. Without this quality, even occasional greatness will destroy a man.*

*"Collected Sayings of Muad'Dib"*
*by The Princess Irulan*

In the dining hall of the Arrakeen great house, suspensor lamps had been lighted against the early dark. They cast their yellow glow upward onto the black bull's head with its bloody horns, and onto the dark glistening oil painting of the Old Duke.

Beneath these talismen, white linen shone around the burnished reflections of the Atreides silver which was placed in precise arrangements along the great table—little archipelagoes of service waiting before heavy wooden chairs. The classic central chandelier remained unlighted, and its chain twisted upward into shadows where the mechanisms of the poison-snooper had been concealed.

Pausing in the doorway to inspect the arrangements, the Duke Leto thought about the poison-snooper and what it signified in his society. *All of a pattern,* he thought. *You can plumb us by our language—all the precise, delicate delineations for ways to administer treacherous death. Will someone try* chaumurky *tonight—poison in the drink? Or will it be* chaumas—*poison in the food?*

Beside each plate on the long table stood a flagon of water. The Duke estimated there was enough water along the table to keep a poor Arrakeen family for more than a year.

Flanking the door in which the Duke stood were broad laving basins of ornate tile. Each basin had its rack of towels. It was the custom here, the housekeeper had explained, for guests as they entered to dip their hands ceremoniously in a basin, slop several cups of water onto the floor, dry their hands on a towel and fling the towel into the growing puddle at the door. After the dinner, beggars would gather outside to get the water squeezings from the towels.

The Duke muttered to himself.

*It's wrong,* he thought. *But how typical of a Harkonnen fief. Every degradation of the spirit the imagination can conceive.* He took a deep breath, feeling the rage as a tightness in his stomach.

"This custom stops here!" he muttered.

He saw a serving woman—one of the old and gnarled ones the housekeeper, Mapes, had recommended and Jessica had approved—hovering in the door from the kitchen opposite him. The Duke signaled with an upraised hand. She moved out of the shadows, scurried around the table toward him, and he noted the leathery face, the blue-within-blue eyes.

"My Lord wishes?" She kept her head bowed, the blue-cast eyes shielded as she spoke.

He gestured. "Have these basins and towels removed."

"But . . . Noble Born—" She looked up, mouth gaping.

"I know the custom!" he barked. "Take these basins to the front door. While we are eating and until we have finished, each beggar who calls may have a full cup of water. Understood?"

Her leathery face displayed a twisting of emotions—dismay, anger.

In a sudden insight, Leto realized she must have planned to sell the water squeezings from the foot-trampled towels, wringing a few coppers from the beggars. Perhaps that also was the custom. His face clouded, and he barked: "I'm posting a guard to see that my orders are carried out to the letter! We Atreides do not waste; we share!"

He whirled, strode back down the passage to the great hall. Memories rolled in his mind like the toothless mutterings of old women. He remembered open water and waves—days of grass instead of dry sand—dazed summers that had whipped past him like windstorm leaves. All gone.

*I'm getting old,* he thought. *I've felt the cold hand of my mortality. And in what? An old woman's greed!*

In the great hall, the Lady Jessica was the center of a mixed group standing in front of the fireplace. An open blaze crackled behind the group, casting flickers of orange light onto jewels and lace and costly fabrics. He recognized in the group a stillsuit manufacturer down from Carthag, an electronics equipment importer, a water-shipper whose summer mansion was near his polar-cap factory—a representative of the Guild Bank—lean and remote, a dealer in replacement parts for spice-mining equipment, a thin and hard-faced woman whose escort service for off-planet visitors reputedly operated as cover for various smuggling, spying and blackmail operations.

The other women of the group seemed cast from a specific type—decorative, and odd mingling of untouchable sensuousness.

Even without her position as hostess, Jessica would have stood out in this group, he thought. She wore no jewelry and had chosen warm colors—a long dress almost the shade of the open blaze and an earth-brown band around her bronzed hair. He realized that she had done this to taunt him subtly, a reproof against his recent pose of coldness. She was well aware he liked her best in these colors—that he saw her as a rustling of warm colors.

Nearby, more an outflanker than a member of the group, stood Duncan Idaho in glittering dress uniform, flat face unreadable, the curling black hair neatly combed. He had been summoned back from the Fremen and his orders from Hawat—"Under the pretext of guarding her, you will keep the Lady Jessica under constant surveillance."

The Duke glanced around the room.

There was Paul in the corner, surrounded by a fawning group of the younger Arrakeen *richece,* and aloof among them—three officers of the House Troop. The Duke particularly noted the young women. What a catch a ducal heir would make! Paul was treating all with an equal air of reserved nobility.

*He'll wear the title well,* the Duke thought.

Paul, looking around him at the clusterings of the guests, the jeweled hands clutching drinks—and the unobtrusive inspections with tiny remote-cast snoopers—seeing all the faces chattering, was suddenly repelled by them. He saw them as cheap masks locked upon festering thoughts—voices gabbling to drown out the loud silence of clocks beating in every breast.

*I'm in a sour mood,* he thought.

He knew why. He hadn't wanted to attend this function, but his father had been firm. "*You have a place—a position to uphold. You are old enough now to do this.*"

Paul saw his father pause in the doorway from the dining hall, inspect the room, then cross to the group around the Lady Jessica.

As Leto approached Jessica's group, the water-shipper was asking: "Is it true that the Duke intends to put in weather control?"

From behind the man, the Duke said: "We haven't gone that far in our thinking, sir."

The man turned smoothly, exposing a bland round face, darkly tanned. "Ah, the Duke," he said. "We missed you."

Leto glanced at Jessica. "A thing needed doing." He turned back to the water-shipper, explained what he had ordered about the laving basins, adding: "As far as I'm concerned, the old custom ends now."

"Is this a ducal order, M'Lord?" the man asked.

"I leave that to your own . . . ah . . . conscience," the Duke said. He turned slightly, noting a new figure come up to the group.

The newcomer was Kynes. The planetologist wore an old-style dark brown uniform with epaulets of the Imperial Civil Servant and a tiny gold teardrop of rank at his collar.

The water-shipper asked in an angry voice: "Does the Duke imply criticism of the old custom?"

"The custom has been changed," the Duke said.

"With the Duke's permission," the water-shipper said, "I'd like to inquire further about customs."

Leto heard the oily, unctuous tone in the man's voice, noted the watchful silence in this group, the way heads were beginning to turn toward them around the room.

"Isn't it almost time for dinner?" Jessica asked.

"But our guest has some questions," Leto said. And he recalled Hawat's memorandum on this man. ". . . *And this water-shipper, Lingar Bewt, is a man to watch. The Harkonnens used him, but never fully controlled him.*"

"Water customs are so interesting," Bewt said, and there was a thin smile on his face. "I'm curious what you intend about the conservatory attached to this house. Do you intend to continue flaunting it in the people's faces . . . M'Lord?"

Leto held his anger in check, staring at the man. Thoughts raced through his mind. It had taken bravery to challenge him in his own ducal castle. It had taken, also, a knowledge of personal power. Water was, indeed, power here. If water facilities were mined, for instance, ready to be destroyed at a signal—The man looked capable of such a thing. Destruction of water facilities might well destroy Arrakis.

"My Lord, the Duke, and I have other plans for our conservatory," Jessica said. She smiled at Leto. "We intend to keep it, certainly, but only to hold it in trust for the people of Arrakis. It is our hope that some day the climate of Arrakis may be changed sufficiently to grow such plants anywhere in the open."

*Bless her!* Leto thought. *Let our water-shipper chew on that.*

"Your interest in water and weather control is obvious," the Duke said. "One day, water will not be a precious commodity on Arrakis." And he thought: *Hawat must redouble his efforts at infiltrating this Bewt's organization. And we must start on standby water facilities at once. No man is going to hold a club over my head!*

Bewt nodded, the thin smile still on his face. "A commendable hope, My Lord." He withdrew a pace.

Leto's attention was caught by the expression on Kynes' face. The man was staring at Jessica. He appeared transfigured—like a man in love . . . or caught in a religious trance.

Presently, Kynes spoke, and his words were aimed at Jessica: "Do you bring the shortening of the way?"

"Ahhh, Dr. Kynes," the water-shipper said. "You've come in from tramping around the Great Flat with your mobs of Fremen. How gracious of you."

Kynes passed an unreadable glance across Bewt, said: "It is said in the desert that possession of water in great amount can inflict a man with fatal carelessness."

"They have many strange sayings in the desert," Bewt said, but his voice betrayed uneasiness.

Jessica crossed to Leto, slipped her hand under his arm to gain a moment in which to calm herself. Kynes had said: ". . . The shortening of the way." In the old tongue, the phrase translated as "Kwisatz Haderach." The odd question seemed to have gone unnoticed by the others, and now Kynes was bending over one of the consort women, listening to a low-voiced coquetry.

*Kwisatz Haderach,* Jessica thought. *Is that legend planted here, too?*

Although she was coldly aware of the dangers surrounding them, the words had fanned her secret hopes for Paul.

*He could be the Kwisatz Haderach,* she thought. *He could be.*

The Guild Bank representative had fallen into conversation with the water-shipper, and Bewt's voice lifted above the renewed hum of conversations: "Many people have sought to change Arrakis."

The Duke noted how the words appeared to pierce

Kynes, jerking the planetologist upright and away from the flirting consort.

Kynes turned toward Bewt. "It is said that there is nothing firm, nothing balanced, nothing durable—that nothing remains in its state, that each day, some time each hour, brings change."

Into the sudden silence, a house trooper in uniform of a footman cleared his throat close behind Leto. "Dinner is served, My Lord."

The Duke nodded, directed a questioning glance down at Jessica beside him.

"The custom here is for host and hostess to follow their guests to table," she said.

He spoke coldly. "So I have been informed."

*The illusion that I suspect her must be maintained,* he thought. He glanced at the guests filing past them. *Who among you believes this lie?*

Jessica, sensing the remoteness of him, wondered at it. *He acts like a man struggling with himself,* she thought. *Is it because I moved so swiftly to set up this dinner? Yet, he knows how important it is that we begin to mix our officers and men with the locals. We are the father and mother surrogate to them all. Nothing impresses this fact more firmly than a sharing such as this.*

Leto was recalling what Thufir Hawat had said when informed of this dinner. *"Sire! I forbid it!"*

A grim smile touched the Duke's mouth. What a scene that had been. And when the Duke had remained adamant about attending the dinner, Hawat had shaken his head. *"I have a bad feeling about this, sire,"* he'd said. *"Things move too swiftly here on Arrakis. That is not like the Harkonnens. Not at all."*

Paul passed them escorting a young woman half a head taller than he. He shot a sour glance at his father.

"Her father manufactures stillsuits," Jessica said. "I'm told only a fool would be caught in the deep desert in one of the man's suits."

"The man with the scarred face who preceded Paul?" Leto asked. "I don't place him."

"A late addition to the list," she whispered. "Gurney arranged for him to be here. Smuggler."

"Gurney arranged?"

"At my request. I cleared with Hawat. The smuggler is called Tuek. He's a power among his kind. They all know him here. He's dined at many of the houses."

"Why is he here?"

"Everyone here will be asking that question," she said. "He will sow doubt and suspicion just by being here. He will also serve notice that you are prepared to back up your order against graft—by enforcement from the smugglers' end as well."

"I'm not sure I like this," he said.

"Hawat's reaction until I told him you must make it plain that you intend to rule *all* of your planet."

"I see no Fremen here," he said.

"There is Kynes," she said.

"Have you arranged any other little surprises for me?" he asked. He led her into step behind the procession.

"The dinner is a conventional one," she said.

And she thought: *We must have one way out, one door through which we can escape if all turns against us on Arrakis. This smuggler controls fast ships. He can be bribed.*

As they emerged into the dining hall, she disengaged her arm from his, allowed him to seat her. He strode to his end of the table. A footman held his chair for him. The others settled down with a swishing of fabrics, a scraping of chairs. The Duke remained standing. He gave a hand signal, and the house troopers in footman uniforms around the table stepped back, standing at attention.

Jessica, looking down the table at him, saw a trembling on his mouth, noted the dark flush of his cheeks. *He's angry,* she thought. *What has angered him?*

"It occurs to me that some might question my changing of the laving basin custom," Leto said. "But this is my way of telling you that many things will change now on Arrakis."

An embarrassed silence settled on the table.

*They think he's drunk,* Jessica thought.

Leto lifted his water flagon, held it aloft. "As a Chevalier of the Imperium, then, I give you a toast."

The others grasped their flagons, all eyes focused on the Duke.

"Here I am and here I remain!" he barked.

There was an abortive movement of flagons toward mouths—stopped as the Duke remained with his arm upraised. "My toast is those maxims so dear to our hearts—Business makes progress! Fortune passes everywhere!"

He sipped his water.

The others joined him. Questioning glances passed among them.

"Gurney!" the Duke called.

From an alcove at Leto's end of the room came Halleck's voice: "Here, My Lord."

"Give us a tune, Gurney."

A minor chord from the *baliset* floated out of the alcove. Servants began putting plates on the table—roast desert hare in sauce, aplomáge sirian, chukka under glass, coffee with melange—a rich cinnamon odor from the spice wafted across the table—a true *pot-à-oie* served with sparkling wine.

Still, the Duke remained standing. He had recognized Gurney's tune.

As the guests waited, their attention torn between the dishes placed before them and the standing Duke, Leto said: "In olden times it was the duty of the host to entertain his guests personally." His knuckles turned white so fiercely did he grip his water flagon. "I cannot sing, but I give you the words of Gurney's song. It's somewhat of another toast . . . a toast to all who've died to bring us wealth."

An uncomfortable stirring sounded around the table.

To be concluded

# SECONDARY METEORITES

*continued from page 16*

Study of the land around the crater reveals four distinct zones with divergent characteristics. Area B is nearly circular with the crater definitely off center toward the NNW. This area is filled by thousands of heat-altered irons weighing a few grams each. Not shown within this area is that the irons were laid down in a pattern of concentration which formed rays with the crater at the convergence of the rays. This would seem to indicate that this pattern was laid down during the first phases of the impact while the meteorite was still very close to the surface.

The other circumscribed areas represent patterns laid down after the meteorite penetrated below the surface. Area C represents a district of madly contorted chunks of heat—altered nickel-iron fragments weighing one ounce to ten pounds. This is thought to be the remnants of the molten phase of the meteorite as it slopped out of the pit.

Area D is an area of spheroids of nickel-iron. It is important to note that in the analysis of these shiny bright spheroids the concentration of nickel and cobalt is increased two and five times the concentration found in the original meteorite.

Over a considerable area stretching for many miles is a fine dust of iron oxide spheroids. We can see that the areas of liquid and gas condensation are stretched to the ENE in the direction of the prevailing winds. There is also a sifting effect with the heavier spherules near the crater and the lighter ones down-wind. It is supposed that from a careful study of their relationships an estimation could be made of how hard the wind was blowing that day.

Finally, there is area E which is symmetrically placed around the crater, but not extending to the north at all. This is the area in which thousands of fragments weighing a few ounces to 1,000 pounds were found. These fragments are unaltered by heat. This means that at no time did the forces exceed the elastic limits of the fragments in spite of the complete reversal of velocity.

From the evidence left around the crater it is known that the primary meteorite was an octahedrite containing a strong Widemenstatten pattern and, among other things, tiny diamonds, about six per pound and 1/20 millimeter in diameter. The diamonds apparently were manufactured on impact from the graphite in the meteorite.

The experts argue about the exact measurements of the Barringer Crater, but we can say that it is roughly 4/5ths of a mile by seven hundred feet from the brim to the bottom. This is perhaps the largest of the well preserved craters. At Vredfort, South Africa a "fossil" ring has been outlined which is thirty miles in diameter. The layers of Earth turned up on edge at the rim of this crater measures nine miles. From this it is evident that great depths of the Earth's crust are occasionally involved. The Moon gives evidence of craters seven hundred miles in diameter. Craters one thousand miles across and two hundred miles deep are theoretically possible.

Since meteorites have penetrated deeper than our deepest mines and interacted with some of the lowest levels of rocks, it would be pertinent to know something about these deep layers. The current visualization of the composition of a planet suggests that the deep layers of the crust are composed of magnesium-iron rich silicates of the olivine series. This olivine is thought to be in frictional contact with the

"MEASURE OF THE MOON" RALPH BALDWIN, DRAWN FROM MATERIAL PRESENTED BY H. H. NININGER

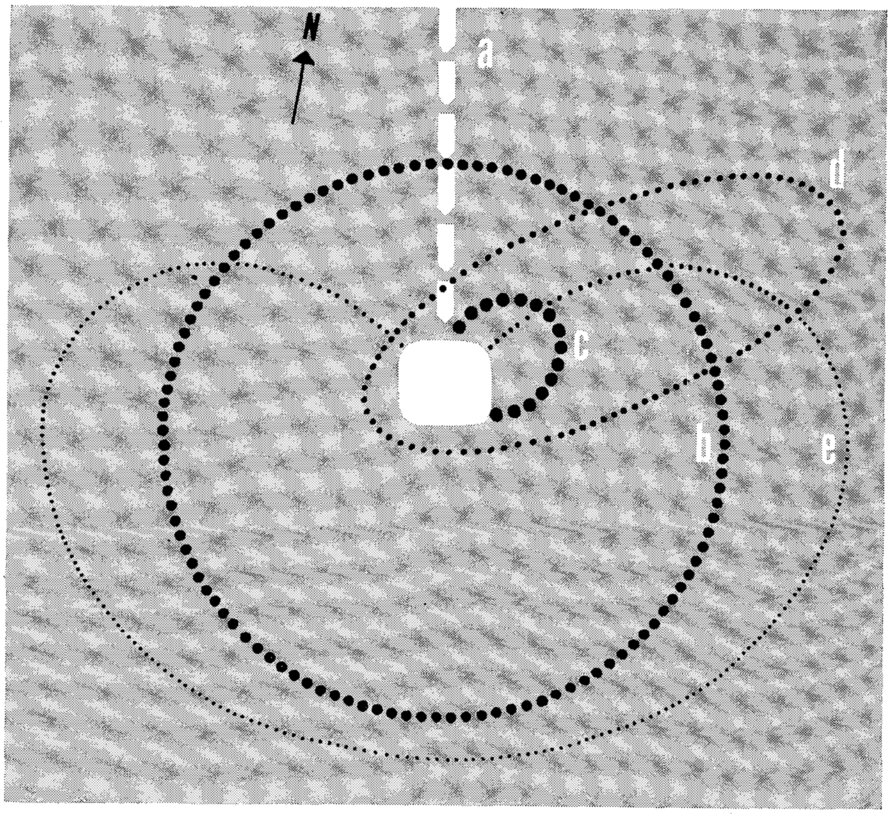


FIG. 1. ANALYSIS OF THE AREAS
AROUND THE BARRINGER METEORITE CRATER IN ARIZONA

*A: The supposed course of the colliding meteorite. E: Area within which thousands of irons of a few ounces to more than 1,000 pounds were recovered. None of these show heat alteration. B: Area within which thousands of irons of a few grams weight were recovered. These show heat alterations and are believed to be rock-penetration strippings. C: Area of heat-altered irons of 1 ounce to about 10 pounds. D: Area of unoxidized metallic spheroids. The whole area is covered by oxidized spheroids.*

nickel-iron core of the planet. From this frictional zone outwards, as one considers the prevalent chemical constitution of the various rock layers concentrically from the center of the Earth, one adds water and oxygen as one moves toward the surface of the planet. Where water is more prevalent, the more soluable minerals containing potassium and sodium are found.

Another factor is floatation. The lighter elements tend to be floated toward the surface of the Earth, thus, aluminum and calcium are more evident on the surface. On planets and satellites where gravitational pull is not so appreciable as the Earth's, these factors would not be so active.

This paper principally concerns itself with the origin of the secondary meteorites. These meteorites ostensibly have been knocked out of other planets or satellites by large fragments from the "Asteroid Planet." These secondary meteorites include some siderolites and the aerolites. The following is a list of "targets" for the large primary "cannon balls" to knock smaller secondary fragments out into space, together with some helpful information concerning them. See Table II. Please note that the escape velocity is the greatest for Earth. All the rest, except Venus, are considerably less.

Our best witness of meteoric impacts, of course, is our own Moon. A fair size telescope reveals over thirty thousand craters on the visible surface of the Moon. They vary in measurable size from a few hundred feet to seven hundred miles in diameter.

As for the Earth, we are finding more and more evidence of meteoric action as we come to understand the signs of shatter-cones, coesite and stishovite. Shatter-cones are fracture patterns in the rocks around meteoric craters shaped like arrows with their points toward the center of the crater. Coesite and stishovite are high-pressure forms of quartz found in the fused bases of meteoric craters. We now recognize that certain weathered and nearly erased signs in the geological formations are in fact fossil meteoric craters. Forty-six have been reported to date. Hudson Bay and the Gulf of Mexico are highly suggestive in their formations.

Now, as we dreamily contemplate Mars and Mercury, we are suddenly awakened with the realization that they, too, manifest crater markings due to Asteroid impacts. We *know* that these planets have been hit by Asteroids. This is the fully integrated concept of the asteroid phenomena. We have only to realize that the markings on Mars and Mercury, as we see them, are meteoric markings modified by the peculiar circumstances of distance from the Sun and erosion factors on these planets.

We note the ray patterns on the Moon around such craters as Tycho, Kepler and Copernicus. We have related how meteoric fragments are found in rays around the Barringer Crater. Similar patterns may be made out on Mars with its suggestion of canals and even fainter patterns on Mercury. The length of the rays is roughly inversely proportional to the gravitational pull of the involved solar body. Velocities of less than a mile per second are all that is required on the Moon to produce rays fifteen hundred miles in length. A large cannon that would fire a projectile seventy-five miles on Earth would fire its projectile two thousand miles on the Moon.

On such a globe without an atmosphere, heavy metal gas acts very much like a solid. In the absence of oxygen the condensing spherules would remain in shiny silver condition almost forever. Experiments with tiny spheres have resulted in most of the light characteristics of the Moon's rays. They can be discerned around some of the smallest craters. Apparently all of them had them at one time, but their patterns have been disturbed beyond recognition by successive overlays by more recent events.

TABLE II. TARGETS FROM WHICH SECONDARY METEORITES MIGHT BE FORMED BY MEANS OF IMPACTS BY PRIMARY METEORITES OR ASTEROID FRAGMENTS

| BODY | MASS | RADIUS | MEAN DENSITY | ESCAPE VELOCITY |
|---|---|---|---|---|
| Mercury | 0.45 | 0.39 | 0.76 | 3.8 km/sec. |
| Venus | 0.82 | 0.973 | 0.89 | 10.4 |
| Earth | 1.00 | 1.00 | 1.00 | 11.3 |
| Mars | 0.108 | 0.532 | 0.70 | 5.1 |
| Deimos | | 0.00062 | | |
| Phobos | | 0.00125 | | |
| Moon | 0.0123 | 0.273 | 0.607 | 2.4 |
| J I | 0.0121 | 0.264 | 0.66 | 2.4 |
| J II | 0.0079 | 0.236 | 0.60 | 2.1 |
| J III | 0.0260 | 0.391 | 0.44 | 2.9 |
| J IV | 0.0160 | 0.360 | 0.34 | 2.4 |
| Mimas | 0.00000636 | 0.041 | 0.09 | 0.14 |
| Enceladus | 0.0000144 | 0.051 | 0.11 | 0.19 |
| Tethys | 0.000109 | 0.081 | 0.22 | 0.41 |
| Dione | 0.000176 | 0.071 | 0.47 | 0.56 |
| Rhea | 0.00038 | 0.109 | 0.30 | 0.67 |
| Titan | 0.235 | 0.373 | 0.45 | 2.8 |
| Iapetus | 0.00024 | | | |
| Triton | 0.022 | 0.35 | 0.51 | 2.8 |

*Jupiter and the other gas-giant planets are not listed, for they are a special case which needs special consideration.*

## *Impact Phase*

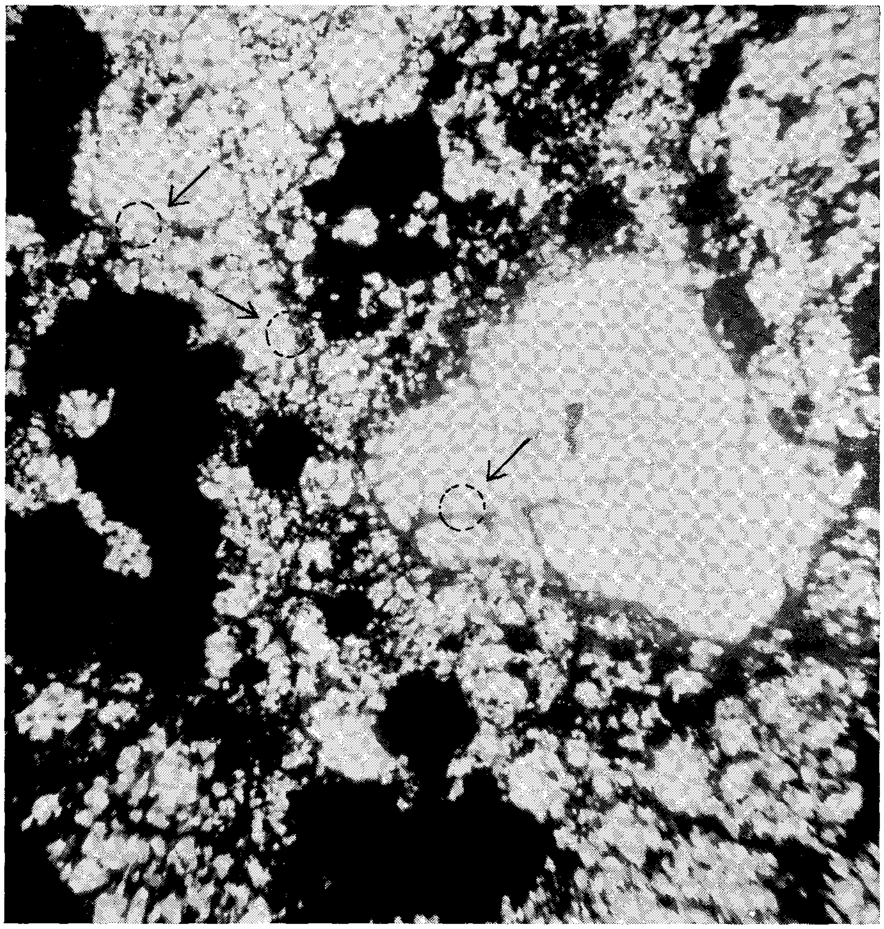
We chose to start our discussion of this problem with a description of a heavy meteorite impact. If we first understand this phenomenon, we can more easily understand the relationships that we wish to emphasize later.

As the meteorite plows into the Earth it resembles, in some aspects, the compression phase of a Carnot's heat engine with the added feature of the physics of plasma formation. The compression phase builds up stepwise as the various electron bonds are broken. Kinetic energy of the incoming meteorite is transferred first to the bonds in the molecules and then to the bonds in the nuclear planetary system, between electrons and their nuclei, breaking them apart.

The electrons are very much lighter than their elemental nuclei, and their kinetic energy and speed is much greater. Plasma being an almost perfect conductor of electron current, the electrons fly through it in lightning streams, shooting out into the surrounding atmosphere, wherever possible causing a cascade ionization of the air. This reacts in a classic quantum, photon fashion to emit light. This has been observed at the instant of impact of a missile traveling a mere twenty thousand feet per second and may well account for the aura of light seen surrounding incoming bolides by many witnesses. The ionization of the air would be assisted by hard X-ray radiation from the high temperature plasma.

At the instant of touch down compression waves start in opposite directions in the meteorite and the Earth. The instant a portion of the interacting materials is compressed the succeeding compression wave travels faster and overtakes the first one. This repeated action builds up a shock wave in the involved materials. By referring to seismic information relating to the center of the Earth, we see that the fastest transmission is a seismic wave through highly compressed nickel-iron is roughly thirteen kilometers per second. Likewise, for rocklike substances we find a transmission rate up to eleven kilometers per second at a level four hundred ten kilometers below the Earth's surface. The rocks do not extend below that level, so no measurement can be made of more highly compressed rocks.

It now becomes evident, by the time the shock waves are started in both the rock and the siderite in opposite directions, the relative speed of approach reaches zero when the sum of the two speeds of compression is equal to the initial speed of the meteorite,



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*Veramin, Karand, Tehran, Persia, fell May 1880 three hours before sunset. Fifty-four kilograms of the mass was found after the appearance of a smoke cloud and sonic booms. This is a mesosiderite consisting of Nickel-iron which shows in the picture as solid black irregular land marks; olivine, which disbursed the transmitted light in such a fashion as to appear in the picture with a slight hallow (three fragments indicated, there are others); and, orthopyroxene, and plagioclase, which is the rest of the irregular gray matter. Prior (1918) writes: "The curiously uneven distribution of the iron and the rather sporadic occurrence of the olivine suggests that both these constituents are in some way foreign to the main mass of stony matter, and to this idea, the peculiar structural features of these meteorites lend support . . . Therefore, there is considerable a* priori *evidence in favor of the idea that the characters of this group of meteorites may be most reasonably explained as the result of a mixture of two types, one of which belongs to a stony mixture, and the other the iron and olivine; a eucritic magma . . . having been invaded by a pallasitic magma." In explaining meteoric structures one must think easily of cold solid to solid changes and cold solid through solid phenomena.*

i.e. 13+ 11 ki/sec = 24 kl/ sec.

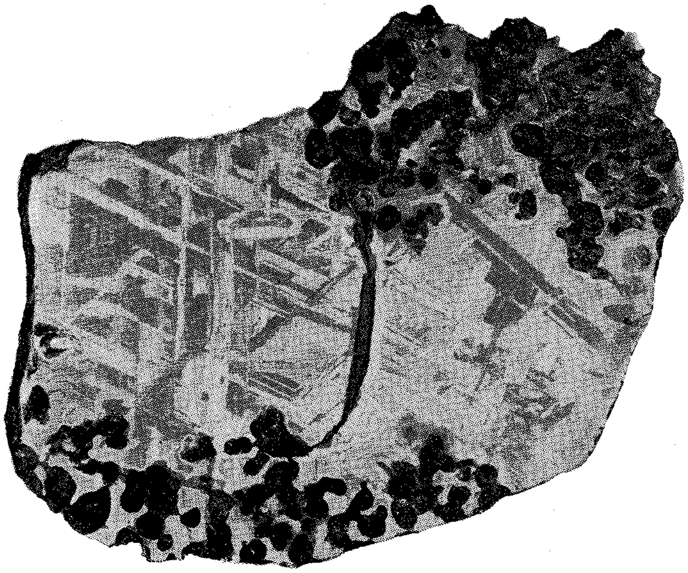
Adjoining the area of the plasma formation is an environ of gas. Here the involved substances have volatilized, though they have retained their electron swarms. Next to the gaseous area would be volumes of liquification. Beyond that would be the products of fragmentation. The extent of these heat effects in the various involved substances is proportional to the conductibility, and inversely proportional to the compressibility of the substance. Plasma gas and liquids convert momentum into pressure. In this fashion the vector forces of kinetic energy are dispersed or broadened in their effect.

This explains the cushioning effect which gradually slowed the hindmost fragments of the Barringer meteorite so that they did not vaporize or even liquify, but instead fractured into relatively large pieces before the explosion tossed them high into the air to fall back again for a distance of five miles around the crater. It is interesting to note that many of these *solid* fragments retained some of the southward velocity of the primary. This velocity was not shared by either the gas or liquid phases of the primary.

Once the total kinetic energy of the meteorites has been transferred to the shock waves into the Earth and meteorite, liquid, gas and plasma conditions of the materials involved, the reaction phase sets in. One usually thinks of an explosion as some sort of exothermic chemical reaction, usually a rapid oxidation. Not so in this case.

Now the electrons heed the call of the nascent nuclei and rush back into the area reconstituting the highly compressed matter of the plasma. Whereas we have been thinking of the speeds of shock waves into the Earth and meteter, these have no comparison to the lightning speeds and almost instantaneous reconstitution of the plasma atoms.

Regardless of the chemical combinations before the fact, wildly reactive



*About twenty specimens of this pallasite were found near Brenham, Kansas in 1882. Together they weighed about a ton. This 18 cm. polished surface reveals clearly the association of crystaline meteoric steel and crystaline olivine. Trying to convince scientists that these two substances had a concurrent origin is like trying to convince someone that a full-grown man was born from the forehead of his father. It is much easier to visualize its formation in the frictional zone between the molten core and the rocky mantle of a planet. In the laboratory nickel-iron alloys have been subjected to 35,000 atmospheres pressure and slowly cooled for months to produce tiny almost microscopic crystals, nothing like the handsome widmanstatten pattern evidenced by this fragment. It is estimated that it took millions of years of cooling under several hundred thousand atmospheres pressure to produce such a large crystaline structure.*

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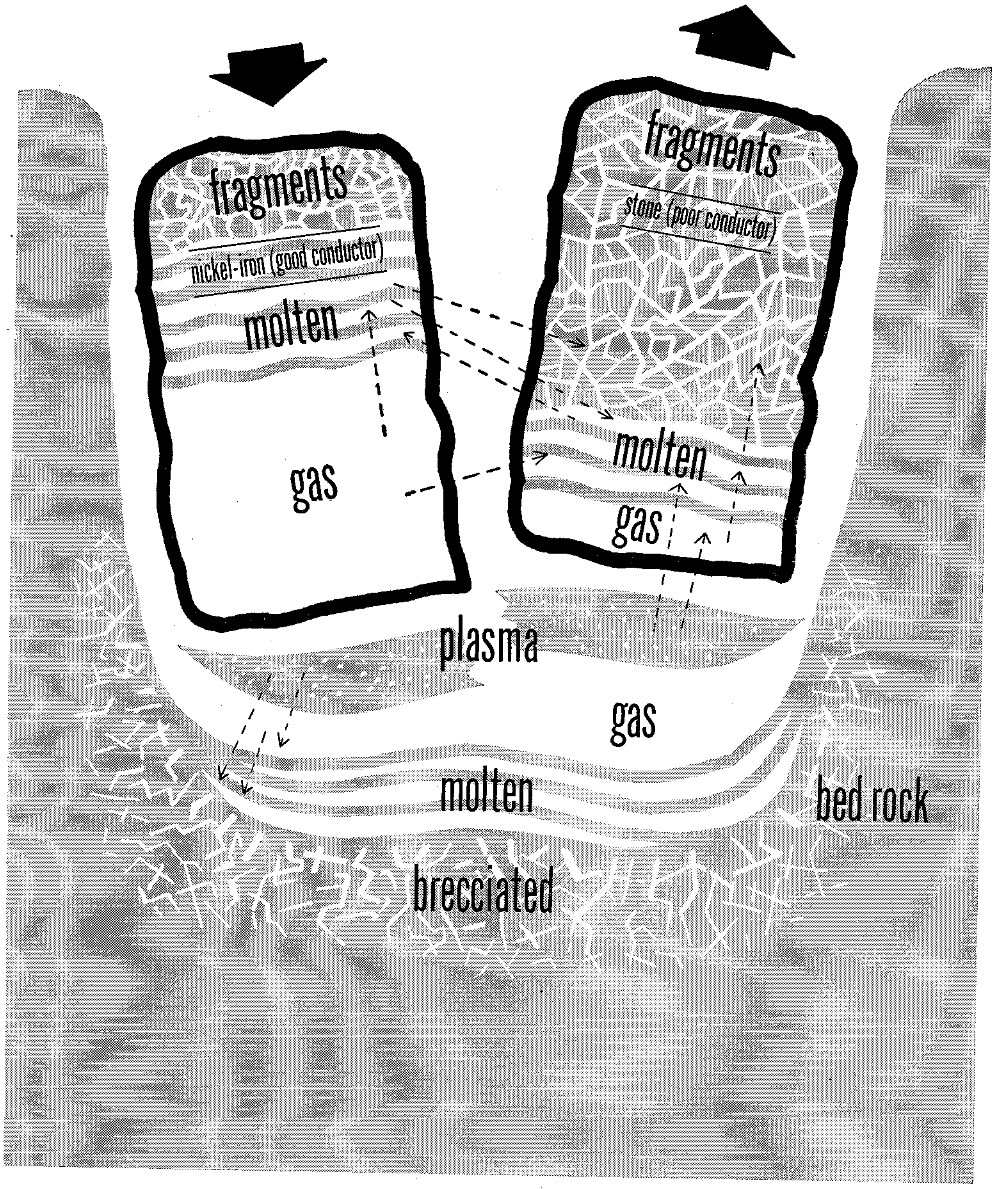
*Fig. 2., (right) This diagram represents an idealized presentation of meteorite impact conditions. The left-hand column represents a heavy meteorite of over one thousand tons striking granite bedrock at a velocity of twenty kilometers per second. The right-hand column represents material to be blown out of the crater. The relationships of plasma, gas, molten and fractured phases is visualized. Also various exchange possibilities are suggested. The pressures are at several hundred thousand atmospheres. Calculated temperatures reach 1,600,000° F. The plasma would penetrate through solid material without much disturbance to the framework, much in the fashion of cosmic rays. The resultant debris would bear witness to very specialized conditions of generation.*

and insecure atoms and molecules would form after the fact. These would be moving at fantastic speeds, impelled and heated by the reconstituting plasma, or shall we call it instant matter. Though the weight and speed of the incoming meteorite may determine the quantity of plasma formed, these factors have no effect on the rate of reconstitution. This rate is almost instantaneous. The quantities may differ, but the impelling speeds of reaction are the same in each case.

These high-speed atomic particles similar to cosmic rays would penetrate any molten, viscous, or porous material, or any material to varying depths carrying with them great heats. The arrows in Figure 2 suggest various possibilities of exchanges. The number of arrows was limited by considerations of clarity and appearances. Perhaps the reader can visualize other exchange possibilities not shown here. One must remember, also, that each arrow is a vector impelling force boosting any native rock fragments to speeds that may in some instances be orbital around the Sun.

Bizarre, unfamiliar reactions would take place. Primary shock waves and reflected shock waves would fracture and refracture fragments of involved rocks. Solid-to-solid cold chemical reactions would take place. Solid-through-solid reactions would occur.



One cannot push an arrow through a block of wood, but one can stand back and shoot it through. So, one solid striking another at speeds in excess of 20 km/sec may interpenetrate. We see galaxies passing through one another in head-on collisions with minimum effect on each other. Could this also be one of the possibilities with solids if the speeds were great enough? Studies of meteorites with this question in mind may give us some previews of the answers.

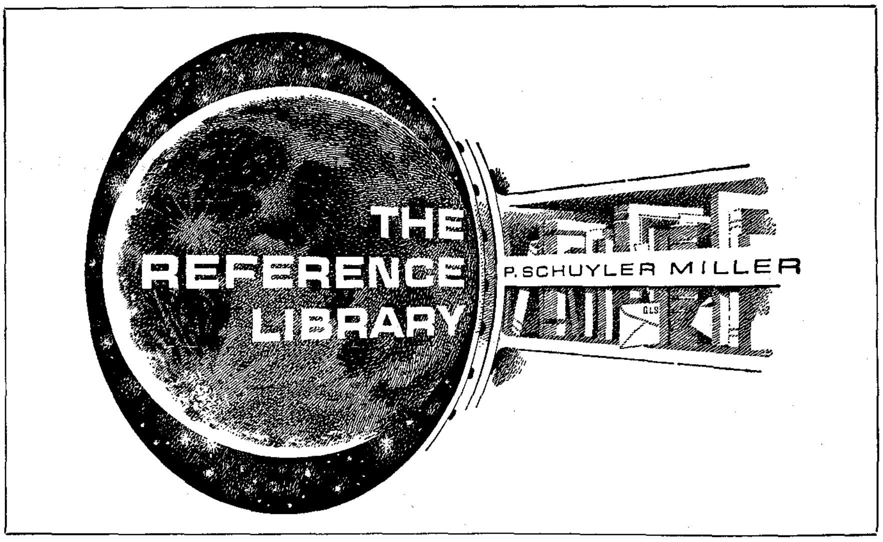
Out of the crater would rise a flaming mushroom cloud from which all oxygen and nitrogen would be banished. The core of the column would be a white hot gas from the materials involved, both rock and steel. In the outer layers where the iron vapor and oxygen meet, the iron would burn like a sparkler, forming black magnetic oxide spherules. Inside the column the metallic vapors would condense without the action of oxygen, forming shiny bright spherules about a tenth of a millimeter in diameter, or so, which would drift down wind. All these effects have been verified at the Barringer Crater.

Now we may turn to a more detailed look at the morphology of secondary meteorites with the foregoing in mind. One could almost predict what they would be.

There are certain basic factors to keep in mind. If a substance is a good conductor, it is more completely affected by heat. If a substance is compressible, it is less affected by a shock wave. In one experiment a hundred pounds of TNT was set off in a field. The clay directly beneath the charge was baked into a terra-cotta type substance without charring the roots that were growing through it.

Whenever a heavy meteorite falls, there is a statistical distribution of the speeds of the secondary fragments. In some instances the secondary fragments may travel faster than the primary. In this case, especially where there is no atmosphere, the secondary will go into a greater orbit than the primary.

(TO BE CONCLUDED)



## THE UNIVERSE OUR STAGE

From the beginning, one of the most powerful and fascinating attributes of science fiction has been its ability to stand off, so to speak, and look at the universe as a whole, from "outside," making its vastness and complexity seemingly understandable. As John Campbell pointed out at the recent Washington science-fiction convention, Dr. Edward E. Smith was the first to make this breakthrough in "The Skylark of Space," in the old *Amazing Stories* of 1928—although the story had been written ten years before, at a time when the galaxies were thought to be gaseous nebulae within the bounds of our own, relatively small "universe" of stars. Almost simultaneously, but in a totally different, individual way, Edmond Hamilton was giving us a feeling of that vastness and of the universality of life and intelligence, with Man but a small, valiant participant.

Before that time, science fiction was almost limited to the solar system; since then there has been no limit. Olaf Stapledon's "Last and First Men," appearing in 1931, must be considered an independent and even greater breakthrough, but it was relatively unknown for a long time, whereas the clamor for more Skylark stories and more by "World-Wrecker" Hamilton was immediate and incessant.

Appearing here in the then Astounding between 1942 and 1949, another series of stories—mainly novelettes, followed by serials—gave science fiction another powerful shove toward infinity. These were the "Foundation" stories by Isaac Asimov. Book versions followed from Gnome Press: "Foundation" in 1951, incorporating and skillfully knitting together the first four stories of the series; "Foundation and Empire" in 1952; "Second Foundation" in 1953. Now Doubleday has brought out a new, uniform edition of all three books—$3.50 a volume—just in time to celebrate the special "Hugo" Award to Asimov at the Washington convention.

Needless to say, this was one of the most popular awards ever made—it was matched in that respect with a First Fandom award to "Doc" Smith, and Edmond Hamilton and his wife, Leigh Brackett, will get recognition as guests of honor at the 1964 Convention in Berkeley, California. Fundamentally, Isaac Asimov got his "Hugo" just for *being* Isaac Asimov, but it could be argued without straining logic much that the award was fandom's Nobel Prize, awarded for a body of work, in contrast to the annual "Pulitzer Prizes" awarded by each Convention.

The "Foundation" stories created a cumulative furor here as the series progressed and readers discovered their uniting theme and plot—the planned renaissance of a multi-thousand-year-old galactic empire after a thirty-thousand-year Dark Age. There was a whopping new concept—the concept of "psycho-history"—rather like a hybrid of Asimov's own robotics and the Spenglerian, Toynbeean theories of evolutionary laws in history. And, in the later stories, there was an absorbing mystery—the location of the Second Foundation—and one of science fiction's few really memorable characters, The Mule.

The basic of psycho-history, developed by Hari Seldon, greatest scientist of the First Galactic Empire, is that in his time humanity had at last grown numerous enough for its behavior to be described by statistical laws. These he discovered, tested, and used to predict the future of the Empire. He foresaw its inevitable collapse from the forces building within it, and took steps to assure its final resurrection—after, as it turned out, some thirty thousand years. Seldon's mechanism was the creation of two scientific "Foundations," "at opposite ends of the Galaxy." It would be their responsibility to carry civilzation through the interregnum and reestablish it again, as the Church had carried it through the Dark Ages of ancient Earth.

In the first book we watch the First Foundation at work over a period of some centuries. Then the focus narrows as a dual threat builds up and promises to destroy the Foundation and Seldon's entire work: the physical threat of conquest by the degenerate remnants of the old Empire, and the internal threat of The Mule, a mutant who may not be governed by Seldon's psycho-historic laws and who consequently may make his predictions invalid. Through the last two books, these threats race against the search for the hidden Second Foundation, which may be able to save civilization from its own self-poisons.

If there are classics in modern science fiction, these three books together constitute one of them. Read them together, now that you can.

### LET THE SPACEMEN BEWARE!

*By Poul Anderson*

### THE WIZARD OF STARSHIP POSEIDON

*By Kenneth Bulmer*

*• Ace Books, New York • No. F-209 • 1963 • 98 + 124 pp. • 40¢*

Poul Anderson's half of this Ace Double isn't one of his very best yarns, but it's a good one, all the same. The Bulmer half, unfortunately, is low-grade Bulmer.

On one level—the one suggested by its title—the Anderson story is a galactic adventure story. The crew of an Argo Astrographical Company ship is probing the far reaches of the Galaxy, where twelve hundred years before many colonized worlds were isolated by the break-up of the first human space-empire. They want to establish a refueling base on one of these worlds, Gwydion—and the people of Gwydion are more than friendly, but queer. Their culture, with ancient Celtic roots, is woven through and through with a tough thread of symbolic double-talk and mythology. They refuse to discuss certain topics, or to give a logical explanation for the signs of violence that are everywhere under the quiet surface of their society. "Bale," a season when they make a pilgrimage to their abandoned Sacred City, is somehow at the heart of the puzzle.

Then there is the puzzle itself, solvable from the clues and consequently a good bit of SF/mystery hybridization, with plenty of hybrid vigor and no signs of sterility. And then there are the characters of Miguel Tolteca, Nuevamerican aristocrat and cherisher of human dignity, and Raven, the hereditary figthing man—two strong men of contrasting cultures and traditions, through whose conflicting and complementing views the puzzle of Gwydion is unfolded. This is the real story.

Kenneth Bulmer is the least of the three British B's—Ballard, Brunner and Bulmer—but he has done some very readable middle-of-the-road adventure stories, and for Ace. His half of this book isn't one of them. Politics rob an undersized but otherwise Challengerish scientist of a grant that will enable him to take over a planet where he hopes to create life under conditions like those which brought it into existence on Earth. With the help of a cashiered Navy nephew he organizes a gang to hijack the payroll the Navy is carrying to a distant world. There are entanglements, double-crossing, and unseen forces at work; there is a well-meaning scientist hero and a beautiful but intellectual heroine who stays out of the way most of the time. And the whole thing collapses into a bouillabaisse of stewed values.

Buy it for Gwydion.

### THE COUNTERFEIT MAN

*By Alan E. Nourse • David McKay Co., New York • 1963 • 185 pp. • $3.50*

Alan Nourse is no stranger here, although he has not been writing much science fiction lately, now that he is a Washington State M.D. instead of a Philadelphia medical student. This book, aimed at the "YA"—"young adult"—readers, is a second-strong collection of eleven short stories and novelettes from various other magazines. They are not up to the selection in "Tiger by the Tail," his previous McKay book—which did have some of his better Astounding stories in it.

The best of the lot is a wry, if slightly heavy-handed switch on present-day labor/management problems. The unions have bought up industries, and the shabby remnants of management are getting the same treatment that labor suffered in the early decades of this century. Then there is a literal "managerial revolution" . . . and a new "Meeting of the Board."

In "Second Sight" a girl's psionic powers are gently developed. It's sentimental but quite nicely done. "The Expert Touch" deals with the ruthlessness of research. The title story has the same theme as John Campbell's classic "Who Goes There"—the alien masquerading as a man; this time a doctor finds him. In "Image of the Gods," the aliens are friendly and the home government ruthless in its efforts to get a cash return from its colonial worlds. "The Link" has a faint echo of Arthur C. Clarke's more poetic stories—a race that has been hounded down the millennia and across space tries to make a stand.

In "My Friend Bobby" the super-child theme is handled well, but not as well as in a number of memorable stories by other writers. "Circus" is a gimmick yarn about the man from an alternate time-track who can't convince anyone he's a visitor. "The Canvas Bag" is a fantasy—a curse has made a man live a hundred and fifty years and will keep him going for a thousand.

"An Ounce of Cure," very short, very slight, is my second favorite. Poor Mr. Wheatley, with a pain in his toe, just can't get past the closed circle of helpful specialists. Finally, "The Dark Door" is another version of the "aliens in our midst" story.

Original publication dates run between 1952 and 1956—by no means vintage years for science fiction, and the author's best stories have been collected elsewhere.

### SPACE VIKING

*By H. Beam Piper • Ace Books, New York • No. F-225 • 1963 • 191 pp. • 40¢*

I'm sure I needn't describe this story in any great length; you read it here in Analog a little over a year ago, as an extremely popular serial. If you didn't read it then, you should now—and if you did, enough time may have passed so that you will find that you can read it again and discover a good deal that you missed first time.

On the surface, this is an interstellar adventure story about a distant future when mankind has spread out among the habitable worlds, built up a galactic empire and seen it crumble, and is now shaping an entirely different type of human culture governed by the physical and sociological forces of stellar times and distances and a short-cutting space drive that makes communication among them possible. One powerful element in this interstellar culture is the Space Vikings—raiders who plunder worlds as ruthlessly as ever their medieval prototypes did on Earth. Lucas Trask, a noble on one of the feudal Sword Worlds, becomes a Viking when a madman kills his bride on his wedding day. And on a second level, the book is the story of the civilization of Lucas Trask and the liberation of new forces among the human worlds.

Try reading it as a parallel to Isaac Asimov's "Foundation" trilogy. It's one of a series of books and stories with which Piper, an old pro who gets better as he goes along, is creating a galactic future of his own.

### LISTEN! THE STARS!

*By John Brunner*

### THE REBELLERS

*By Jane Roberts*

*Ace Books, New York. No. F-215*
*1963 • 96 + 155 pp. • 40¢*

If you read the Brunner story here in Analog in the July 1962 issue, there's no reason for buying this particular Ace Double—unless you want to read it again. "The Rebellers," though apparently an original story, is one of the poorest Ace has had in a long time.

If your memory needs priming, John Brunner's story is a very well done psionic mystery—one of the best psi stories I have seen in a long time. It's the one about the "stardroppers," peculiar little instruments that drain strange sounds, or music, or voices out of the depths of space. The young and old of the world have become as addicted to them as our present generation of teen-agers seems to be to transsistor radios—but with a difference. Many of the stardropper addicts seem to undergo a real mystical experience. Others become insane. A few disappear. Dan Cross, a United Nations agent, comes to England to try to find out what is going on—and, of course, does.

Miss Roberts' story is crammed to bursting with possibly interesting elements, but they remain mostly undigested. The scene is the present Elmira, New York, in a future in which the population explosion has totally overrun the Earth. A feckless government is trying to keep synthetic food factories going. Colonies of artists and writers, locked up for a generation or more, turn out propaganda that is supposed to keep enough people working enough of the time to keep the food coming. There is, of course, an underground of competent and scientifically trained rebels who manage to keep them and theirs well fed. Epidemics periodically sweep the "contropolis"—the author apparently confuses bubonic plague with smallpox—but do little to reduce the population. In a food raid on his "gallery," one artist, Gary Fitch, escapes and turns into the strong man who solves everything. Come to think of it, if Earth is totally without vegetation—it's all been eaten—there must be a government oxygen plant somewhere, too. Unlike John Carter in Burroughs' Mars, Fitch doesn't have to get that going. I'm not so sure he could have handled that one.

### BATTLE ON VENUS

*By William F. Temple*

### THE SILENT INVADERS

*By Robert Silverberg*

*Ace Books, N.Y. • No. F-195 • 1963*
*• 104 + 117 pp. • 40¢*

We haven't seen much recently of the author of the enjoyable "Four-Sided Triangle" of long ago, and if this is what he is writing for the English magazines these days, it's easy to see why. The Silverberg half of the Ace Double is also pretty minor stuff.

A seemingly pretty incompetent crew, with whom one never achieves any identification, blunder to a crash landing under the poisonous clouds of Venus. They find themselves in the middle of a slugging war of machines, which in due course finish the wrecking of their rocket. A helicopter pilot takes off to look for the master minds behind the war, and after some misadventures finds them—or rather it, for the whole planetary holocaust is an automatic war dreamed up by a bored, childish superman to liven the ennui of his immortality. In the process, he has wiped out the population of the planet, except for a few remnants almost as queer as he. George the Helicopter foils the villain, wins the girl, and they all get back to Earth in the nick of time.

On the flip side, Robert Silverberg handles a yarn rather like "Ivar Jorgensen's" current "Ten From Infinity" with far more competence. Rumor has it that at one time Mr. Silverberg *was* Ivar Jorgensen, but that's another story. At any rate, in this one spies from two humanoid but nonhuman galactic races, enemies for millennia, are on Earth in human disguise. Aar Khiilom of the Darruuii, posing as Major Abner Harris, is one of his world's elite, conditioned from birth to the traditions of his race; he is one of ten agents who hope to seek out and destroy a hundred similarly disguised Medlin fiends. Only the Medlins—one of them now a highly attractive young Earth woman who makes Abner's synthetic hormones bubble—convince him that they are intergalactic philanthropists, and that his own people are the Nasties. And Earth is breeding its own super race . . .

This reads like pretty venerable Silverberg.

### BRIDGE TO YESTERDAY

*By E. L. Arch • Avalon Books, New York • 1963 • 192 pp. • $2.95*

An original chase story by an author new to the field, this has an interesting beginning but winds up a maze of loose ends and wasted leads.

Leo Tenney, for never quite clear reasons, has been put in a suspended animation machine in an abandoned mine. There is a rock-fall, and his partner abandons him for twenty-five years. Awakening and escaping, he joins forces with a girl who is trying to find out what happened to a reporter lost in the jungles of Ganymede, where he had gone with a promoter who has the same initials as Tenney's former partner.

There is a nicely grim little episode on Ganymede—but nothing comes of it or is done with it. I'd rather know why a man should take root in the ground than what name Virgil Smith will use next. There's another in a rest camp for the insane, but that is also shoved aside in a hurry. And in the end, the chase falls flat.

### EXPEDITION VENUS

*By Hugh Walters • Criterion Books, New York • 1963 • 191 pp. • $3.50*

### SPACE AGENT AND THE ISLES OF FIRE

*By Angus MacVicar • Roy Publishers, New York • 152 pp. • $ 2.95*

These are both examples of current boys' SF series, published in England and now brought out in American editions. Hugh Walters' stories about young Chris Godfrey we've met here before, but Roy seems to have leaped into the middle of its series about "Space Agent" Jeremy Grant. Both belong with the poorest of the Winston SF juveniles.

Coincidentally, both authors have been impressed by the public statements about sterilization of rocket probes sent to sample other planets, and have written stories about other-world vegetation brought from Venus and Mars, respectively, by our own probes. In "Expedition Venus" it is a gray mold that threatens to envelope the Earth; Godfrey and his pals, with a young French biologist, are sent to Venus to find the mold's natural enemy, and after assorted perils, do so. The unresolved business of the perilous life form they found on the moon in previous books has been forgotten—or Criterion has skipped a book in the series.

In "Space Agent," a Martian plant has established itself on a South Atlantic isle much like Tristan da Cunha. This one is an intelligent, telepathic monster that takes a lot of killing. On the whole, the action is more outrageous but more plausible—at the time—than in Walters' book.

A quote from the end of Chapter Six in "Expedition Venus" characterizes both books: "The fate of the world is at stake. If it kills every man on the base, we'll blast-off that Venus rocket in sixty hours!" Remember?

### CONTINENT IN THE SKY

By Paul Berna • Abelard-Schuman, *New York • 1963 • 192 pp. • $3.50*

This sequel to "Threshold of the Stars" is for younger children than the teen-age juveniles reviewed elsewhere, but it is more mature than either of them. For all that, it is not up to the first book, in which a group of French children nosed about the launching of a spaceship to the Moon.

Michael Jousse, now fifteen, stows away on a moon ship and finds himself in trouble from the first. A commercial war has been going on behind the scenes, and an English-American syndicate seems to be about to take over from the French group who pioneered in space and terraformed the Moon by giving it a breathable atmosphere, in the earlier book. There are, of course, traitors in the home camp, and plenty of action on the face of the strange satellite. Unfortunately, in the act of saving himself a lot of space-suit technology by giving the Moon an atmosphere, the author has also invalidated some of the temperature extremes he uses in his plot.

Give me Heinlein, Norton, Nourse—they won't write down to kid level.

### LOST ON VENUS

*By Edgar Rice Burroughs • Ace Books, N.Y. 1963 • No. F-221 • 192 pp. 40¢*

Ace is out first with the second of Burroughs' "Author" books, describing the adventures of Carson Napier on Venus. In this series Burroughs was imitating Otis Adelbert Kline's imitations of his own Barsoom yarns, and he didn't do as well as Kline—nor did Kline do well when he, in turn, tackled Mars.

At the end of "Pirates of Venus," Carson Napier—who headed for Mars but landed on Venus—has lost his intended, the beautiful princess Duare of Vepaja, and is captured by a new set of thugs. In this series of episodes, he and they bounce from one to another peculiar lot of people: beast men, zombies, and finally the super-scientists of Havatoo. The latter give Burroughs an opportunity to satirize the foibles of scientists and emphasize the fact that they are still human beings, with human flaws that can elbow pure intellect out of the way when reason becomes inconvenient.

The biggest inconsistency in this whole series is the way in which Napier, who can telepathically transmit his exploits back to Burroughs in Tarzana, never uses his talent on Amtor to find Duare, scout for danger, or find out where he is going.

### TEN FROM INFINITY

*By Ivar Jorgensen • Monarch Books, Derby, Conn. • No. 297 • 1963 • 139 pp. • 35¢*

"Ivar Jorgensen" used to be the "house" name used by a number of young, prolific writers in their less ambitious—and less expensive—days. Now, we are told, it is being worn by "a former topflight magazine editor" from the Midwest, essaying his first full-length SF yarn. If he was a science-fiction editor, he probably would not have bought it himself.

Unspecified Enemy Aliens from the far, far stars can't take the gravity, atmosphere and climate of Earth themselves, but being Malignant Aliens by nature and nurture they resolve to conquer us with an army of androids. They snatch a New York judge, construct ten replicas, and send them back on a test run. When and how these ten prototypes fail, if they do, will point up flaws that can be eliminated in redesign of the invading army of supermen from the stars.

As the story opens, eight of the ten have come to ill fates by collapse, accident, *et al,* and the ninth has just had a leg broken. A young intern with an Uptown girl friend and a newspaper photographer fasten on different facets of the man's peculiarity—he has two hearts, among others—and both encounter Number Ten, the straw boss of the gang. Unspecified agencies in Washington have long been on the trail, and a demagogue Senator is also in the act. Meanwhile Mr. Ten, alias John Dennis, has hypnotized Dr. Corson's girl and is learning about women from her.

There is enough graphic sex to please the usual Monarch readership, and a final burst of throat-cutting violence. Hollywood, anyone?

### IS THERE LIFE ON OTHER WORLDS?

*By Poul Anderson • Crowell-Collier Press, New York • 224 pages • $4.95*

Poul Anderson's answer is, of course, "Yes," which won't surprise any science-fictioneer — who is, of

## THE REFERENCE LIBRARY

course, a reader of Poul's top-notch science fiction. But this book is strongly recommended to science-fiction writers and readers; it has a lot of genuinely new approaches to some of the problems of possible planetary types.

Science-fictioneers—who have been primarily responsible for speculation about other planets—have limited their discussions practically to three types of planets; the airless Moon type, the Terrestrial type, and the Jovian gas-giant types. Poul Anderson points out that there are several intermediate types, and a separate class, the super-jovian, with mass ten to twenty times that of Jupiter—we've got evidence that such super-planets circle some of the nearer stars!—which have the curious characteristic that as their mass exceeds Jupiter's their diameters *decrease*. Then there are the sub-jovian, and the superterrestrial types. Neptune and Uranus are sub-jovian, in not being true gas-giants.

And discussion of the "life zone" around stars takes a lot of consideration as to what type of planet is involved, and how much greenhouse effect is involved.

All solid stuff—and new! *(John W. Campbell)*

*Movie:*

### THE HAUNTING

*Metro-Goldwyn-Mayer production based on Shirley Jackson's novel, "The Haunting of Hill House."*

The excuse for including this note on a motion picture which is not, ostensibly, science fiction, is that for once I managed to see it before its general release, so that these comments may still be of interest, and that it is very well done. The director, whose name I missed, followed the Jackson novel closely and almost escaped the stereotype of the horrible face in the dark—not, incidentally, from the book. The haunting itself is vicious and horrible in a way that no monster movie ever has been.

No "explanation" is given for the haunting; the ghosts are ghosts. But are they? When you've seen the picture, I suggest that you think about it as science fiction. From this point of view, the horrors of Hill House exist in Eleanor Vance's psychotic mind, and are picked up and amplified by the telepath, Theodora, until they are felt by everyone else—including the audience. Who says? Nobody says. But think about it.

This could be the "Hugo" winner for drama next fall, unless the British production of "Day of the Triffids" or some still unheralded film or TV special makes more of an impression.

*Bibliographical Corner:*

Science fiction and fantasy fans compile and publish a great deal of valuable bibliographical information in the course of a year. Some of the separate publications I see and report here. Articles in the regular fanzines—fan-published magazines—I often pass up unless they are exceptional, since this is by no means a fanzine department. Others I never see.

Here are two recent bibliographies that will be invaluable to the collector, librarian or student of science fiction and fantasy.

### INDEX TO THE SCIENCE FICTION MAGAZINES: 1962

*Compiled by Al Lewis • Al Lewis, 1825 Greenfield Ave., Los Angeles 25, California. • 1963 Mimeographed • 54 pages • 75¢*

This has four parts: (1) an issue-by-issue listing of the tables of contents of the SF magazines published in 1962, including the three English ones; (2) an author index covering all the magazines; (3) an alphabetical title index; and (4) an index of books reviewed. The form of the listings follows Day's *Index to the Science Fiction Magazines, 1926-1950.* The index is intended to supplement the second Day volume, covering 1951-1960; it is the second the Los Angeles group has put out, and a "must" if you want to refer back to your magazines.

### INDEX TO THE WEIRD FICTION MAGAZINES: INDEX BY TITLE

*Compiled by T.G.L. Cockcroft, Lower Hutt, New Zealand • 1962 • 60 pp • In the U.S.: F & SF Book Co., PO Box 415, Staten Island 2, New York • $2.75 • In the British Commonwealth: Fantast (Medway) Ltd., 75, Norfolk St., Wisbech, Cambs., England • 17s 6d.*

Many early science-fiction stories appeared in these fantasy magazines. It is unfortunate, however, that the author index—to come—couldn't have been in this same nicely lithoprinted booklet. A checklist of the magazines covered, with the name of the cover artist and story illustrated, precedes the alphabetical listing of story titles. Magazines covered are: *Weird Tales*, 1923-1954—279 issues; *Strange Tales*, 1931-1933—7 issues; *Strange Stories*, 1939-1941—13 issues; *Strange Tales* (English magazine), 1946—2 issues; *Thrill Book*, 1919—16 issues; *Oriental Stories* (adventure, with some fantasy-adventure), 1930-1932—9 issues; *Magic Carpet* (new name for *Oriental Stories*), 1933-1934—5 issues; and *Golden Fleece* (historical adventure), 1938-1939—9 issues.

*Convention-Goers*

If you attended the 20th World Science Fiction Convention in Chicago, in 1962, you may want to have the photographic record of people and events published by Jay Kay Klein of Syracuse, New York, photographer and editor, and Frank R. Prieto, Jr., of RD #1, Box 255, Warners, New York, the publisher. There are two parts: 24 pages of "candid" photos, very well lithoprinted and numbered for identification, and a 74-page mimeographed summary of the Convention plus identification of the people in the photos, where this has been possible. You may find yourself there. This is the second such album cum report from these energetic fan publishers; the first covered the Pittcon in 1960, and there will be one for the 1963 Washington convention. Quantities are limited; the two parts cost $2.00 from Prieto at the address given.

## BRASS TACKS

continued from page 5

reach a future vaguely like that in the novel we know, with underworld workers supporting a world above. In the second revision, Nebogipfel is cut out, along with the underworld.

The fourth version of the story consisted of seven unsigned articles published in the *National Observer* between March and June, 1894, while W. E. Henley was editor. These articles are nearer the version we know, but lack a sustained narrative. The series was broken off when Henley left the *Observer*, but Wells kept writing "on spec." When Henley became editor of the *New Review*, at the end of 1894, he accepted the serial narrative and ran it in five parts, January through May, 1895. Two differing book versions were published at about the same time that year by Heinemann in London and Holt in New York—making a total of seven known versions of the novel. Wells had worked hard at it, and the revisions show him learning his craft.

(Most of these facts come from my own unfinished dissertation on Wells as critic of the idea of progress. Useful sources are Wells, "Experiment in Autobiography"; Geoffrey West, "H. G. Wells"; and Bernard Bergonzi, "The Early H. G. Wells." Bergonzi reprints "The Chronic Argonauts." In an article, "The Publication of 'The Time Machine' 1984-5," in *Review of English Studies*, Vol. XI (1960), he compares the textual differences between the later versions.)

Jack Williamson

*What we need is a Time Machine to get the full data on "The Time Machine"!*

Dear Mr. Campbell:

My son, a wandering petroleum geophysicist, has his magazine sent to my address, and thus I came to read your editorial in October Analog, which accorded one hundred per cent with my personal view, in spite of the fact that I regard science fiction as unutterable hooey.

In 1944 I was assigned to a Nisei—Japanese-American—Army unit, much against my will, for my first-born son died a POW in Japan. My association with those men through the last two years of the war and through correspondence with them and with native Japanese, since then, have reinforced any ideas I may have formerly had on "integration."

My unit was very small, but since the war ended, one man has become assistant superintendent of schools in Oakland, California, where he would once have been outlawed as a yellow bastard; his field: "All nursery schools." He was my highest ranking non-com. A kid lieutenant whom I approved for OCS, is now PhD, an atomic scientist at Brookhaven; perhaps you know the name: Yoshio Shimamoto. Another of my small group was candidate for house of representatives from Hawaii, beaten by another AJA—American of Japanese Ancestry—on the other party. *Nowhere is the Nisei rejected socially. Why? Brains and the will to use them.*

I subscribe to a San Francisco-Japanese-English Daily — *Hokubei Mainichi*—and find that the Japanese Americans will not, except for a few individuals, support the present Negro agitation. Their argument: "They haven't made it."

As a high-school teacher I had an outstanding Negro pupil: one. A Negro talking to the Japanese group in San Francisco boasted that a Negro was present at "one of the skirmishes that initiated the American Revolution." The Negro in question was a *mulatto*, member of a drunken or half drunken mob that taunted a lone English sentry to fire upon them. The sentry called the guard, as was his right and duty, and the guard ultimately eliminated a half dozen similar rioters. Throughout the South, five miles from here, are high schools named for that drunk: "Crispus Attucks High School."

I am not a deep south wool hat. I am a northerner, graduate of the Little Ivy League: Amherst.

Prove Negro equality, and I will accept it.

I had a year of Anthropology at University of Oklahoma, 1951-2, on GI bill, but I utterly reject any theory that all human beings have the same IQ. God knows I had enough dumbclucks in my white classes . . .

Gordon T. Fish

Fort Lauderdale,
Florida.

*Well—he can hardly be accused of a "white supremacy" motivation for his attitude . . .*

Dear Sir:

This office has only recently been advised that your October, 1962 issue, Vol. LXX No. 2, while highly interesting, does contain two errors.

From the point of view of our company, they are serious errors. On pages 91 and 93 figures 8 and 9 identify Aerojet-General Corporation rocket engines as belonging to Rocketdyne.

To avoid any further mistake, figure 8 on page 91 shows Aerojet-General Corporation's first-stage rocket engine system for the Air Force Titan II. The twin-barreled engine uses hypergolic propellants—aerozine-50 for the fuel and nitrogen tetroxide for the oxidizer. The engine has been designed, is being tested and is being produced by Aerojet-General Corporation's Liquid Rocket Plant near Sacramento, California. At 430,000 pounds thrust, it is the most powerful liquid rocket engine now in use. In addition to the Titan II ICBM, the engine system will also be used in the Gemini program and in the Titan III.

Figure 9 on page 93 shows the second-stage rocket engine system for the Titan II ICBM. It also is a product of Aerojet-General Corporation's Liquid Rocket Plant. Again, it uses hypergolic propellants. At 100,000 pounds of thrust, it is the most powerful rocket engine ever to start at altitude. In fact, by proving that large pump-fed rocket engines can be started at altitude, far from the hands of man, the Aerojet Titan second-stage engine is paving the way for the use of even larger and more complex altitude start rocket engines now being prepared for the

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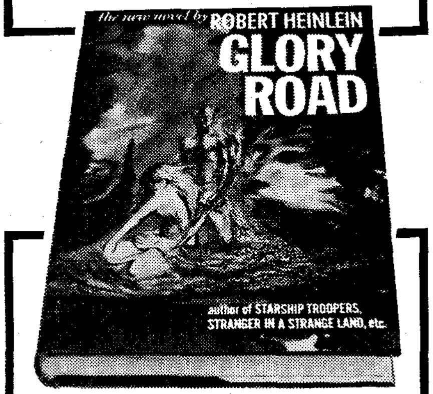
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## BRASS TACKS

Apollo program. In addition to the components shown in your figure, the Titan second-stage engine features an ablative skirt for altitude operation. The ablative skirt increases the engine's performance and makes it more simple to operate. The second-stage Titan II engine will also be used in the Gemini program and in the Titan III.

Since the advanced features of the Titan II propulsion system include some of the most significant contributions yet made to the rocket industry by the Aerojet-General Corporation we naturally are sensitive when they are identified as a product of Rocketdyne.

JOHN Z. ICKES
Manager Public Relations
Sacramento Plants
Aerojet-General Corporation
Sacramento, California 95809

*Our apologies; somewhere along the line, the correct picture captions slipped, got confused, or something.*

Dear Mr. Campbell:

This is in reference to the published letter in the September issue of ANALOG signed by G. Harry Stine and E. L. Victory.

Mr. Stine's letter refers to their construction of a "simple mechanical oscillator of the type described by Mr. Dean" and refers to operation "under exactly the conditions described by Mr. Dean in his letter." (ANALOG—May, 1963.)

The objectives and instructions of my letter were directed to the method approaches of creating a specific dynamic structure under conditions that permit the isolation of that dynamic structure as a dynamic entity, and permit observation and analysis of its inherent behavior as an entity.

The experiment described and illustrated in Mr. Stine's letter is in direct violation of the construction and conditions stated and required in my letter, and it is not within reasonable limits of the mandatory objectives. We are not here concerned with academic speculation, but with bad engineering. This letter considers the most obvious.

For instance, my May letter contains the following sentence:

> "The object is to apply rotating force without the means influencing *in any way* the free oscillation of the oscillator that results only from the forces induced within the oscillator itself."

The photograph and description in Mr. Stine's letter indicate that rotational force is applied by a heavy—apparently half-inch or more—steel drive rod with commensurately heavy universals and other elements. The free end of this rod—and its elements—is attached to a comparatively light oscillator with a combined eccentric mass stated to total 1607.3 grams.

Mr. Stine states, "The ratio of the mass of the—eccentric—weights to the mass of the carriage was 0.9333." We doubt it. The *effective* "mass of the carriage" includes the carriage plus the mass of the drive rod, and all of its attachments, that are oscillated by and with the carriage.

Unfortunately, this large extraneous mass of Mr. Stine's experiment is not distributed on the carriage, but is attached to, and extends from, one end of it. In oscillation, at any speed, such relationships will create "whip," "over throw," "weave," "shock," and other effects of high relative magnitude, that most emphatically influence the oscillation of the oscillator by forces other than those induced within the oscillator itself. Their most useful result is the inevitable self-destruction that Mr. Stine says is usually achieved, but the conditions that permit the "phasing" behavior to occur are not present.

Further reference will be made under "constant angular velocity."

Mr. Stine's inferred suppositions that such relationships are necessary to prevent structural failure are not acceptable. Such relationships only help to create the forces of their own destruction.

For "phasing" observation, we have used and demonstrated oscillators with combined eccentric masses of over four pounds of one-half inch (m-1) eccentricity, with rotational force applied by quarter-inch drill rod, light aluminum universals—aligned in accordance with designer's instructions—and a light aluminum and steel non-distorting slip-joint of the spline type, weighing possibly three ounces.

With heavy equipment, with total oscillator weight of over twenty pounds, at 600 RPM, we have applied rotating force by means that influence the free oscillation of the oscillator only to an amount that is measurable in ounces.

In fifteen years of analytical work, no equipment of ours has ever suffered operational damage other than from accident or anticipated wear.

Another condition, as stated in my letter, reads:

> "Of utmost importance, drive the rotors at *reasonably constant angular velocity*."

Mr. Stine's letter reads: "It is interesting to note that ordinary slipper-type joints such as the type used by Mr. Dean and available for Boston Gear, DO NOT transmit rotary motion with constant angular velocity."

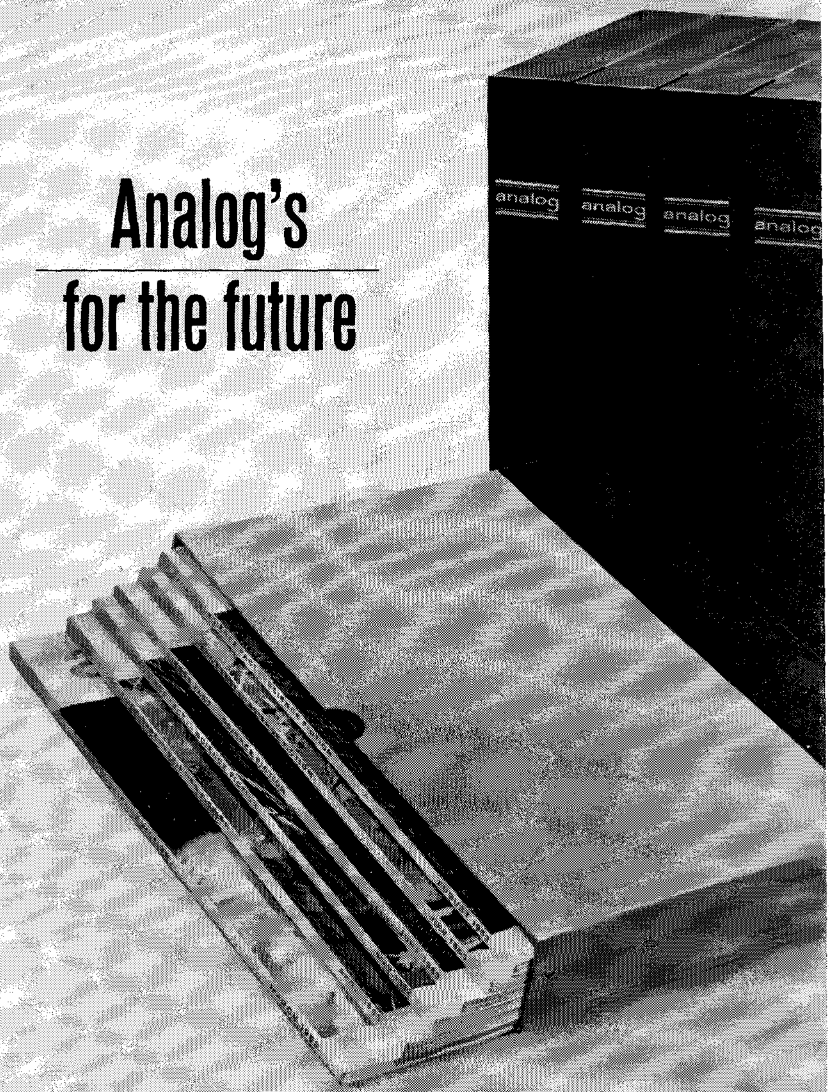
Mr. Stine should define for you what he believes a "slipper joint" to be. From the text, he apparently confuses it with a "universal" joint.

A "slip-joint," as illustrated in the material referred to in my letter and as it is commonly known, is a spline-type joint permitting extension or shortening of a drive rod without in any way affecting the functions of the straight rod.

Its use and its purpose are obvious in the drive line as the drive rod shortens and lengthens with the oscillator's oscillating position relative to the fixed motor.

If Mr. Stine does not differentiate between a slip-joint and a universal, he should have told you how he applied the arrangement, that he illustrates and describes, to the oscillator, and its effect on the motion of the rotors and the oscillator.

When driven in a straight line, universal joints, like slip-joints, have no distorting effects. However, at an angle, they tend to produce a number of known effects, including torsional



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# BRASS TACKS

stresses, whose intensity and strain increases with the angle, the speed, and/or the force applied. Mr. Stine's imposition of the forces of the inertial mass of a ten-pound flywheel at the fixed end of his unyielding input line helps to assure that all such effects will be realized at the free, or oscillator, end of the line, until either the oscillator or the universals fail.

Of more importance, Mr. Stine should have told you of the effect of the forces that he has so mis-applied, not only on the angular velocity of the rotors, but the effect on the "free oscillation of the oscillator." One, or both, must accommodate them.

It is the *rotors* that are required to be driven at reasonably constant angular velocity.

The two universals stated in my instructions, in "phasing" behavior observation, have, in reasonable equipment, a maximum angle of deviation from a straight line of from zero to—approximately—one degree only in each cycle. The small torsional distorting effects are largely absorbed and averaged in the intended normal torsion of the relatively small diameter steel rod.

Our records include high-speed movies, professionally taken, which show and permit clear factual analysis, frame by frame, cycle by cycle, of the exact progressive positions of the eccentric masses in rotation. These movies further permit observation of repetitive cycles of "phasing" behavior and permit factual analysis of the "phasing" behavior.

In operation, the effects of the application of rotating force by the means described and illustrated in Mr. Stine's letter are most unlikely to permit any "phasing" behavior to occur, and for reasons that should be obvious to anyone familiar with either engineering or dynamics. Such application means a direct violation of the stated and mandatory objectives, requirements and conditions.

For what purpose do Mr. Stine and Mr. Victory state to you and to others, as indicated by their letter, that their described "experiment" is in compliance with our instructions, stated and required objectives, and as being in conformity with proprietary data?

We note Mr. Stine's reference to the work of his associate, Dr. Davis. Neither we, nor participating foreign engineers, find that Dr. Davis' interesting theories on transients have any observable application to the principles and practice of our proprietary work, and know of no reason why they should. The "phasing" behavior, for instance, is the logical resultant of known and familiar laws, knowledgeably applied and intelligently implemented.

Norman L. Dean

3601 Wisconsin Avenue, N.W.
Washington, D. C.

*O.K., boys—you settle the argument between you!*

Dear John:

I very much enjoyed your editorial from July '63 Analog because it forced me to revaluate the comfortable—to me at least—idea of a great many possible planets for possible future colonization.

The problem that anyone faces in using a sample, or small group, for research into a large group of things is one of selecting a group that is representative of the whole. "Representative" implies in many cases a certain knowledge of the whole; in other cases it implies a limitation either in equipment and time, or in the availability of the group for study. Chance, of course, plays an important role no matter what the case is. In studying planets ours is the latter problem. We assume that there are lots—"large number"—of planets in the universe, but we just "ain't able" to get a good look at many of them. Thus my first comment is that all you have said in the article could be falling for the same trap that we have fallen for for so long: "I know what planets are like, I've seen some".

Considering Mars and Venus for the moment as examples the more probable—how much more probable is a good question—non-binary planet system we have—handbook chem-physics—that the acceleration due to gravity on Venus is 820 $\text{cm/sec}^2$ and on Mars is 392 $\text{cm/sec}^2$. The one retains a dense atmosphere, the other doesn't. Where is the dividing line between a planet that will retain a dense atmosphere and one that won't? Obviously we don't know since we don't have any data. Perhaps men are going to have to get used to a good deal test "gravity".

It's the other question of where did all the water go that may prove to be the clincher in tying man down! On Mars the common nitrogen and oxygen are present, but the hydrogen seems to have escaped. On Venus I assume that all three—plus, of course, carbon—are present because Earth managed to retain all three even with the Moon to thin things out. I don't know much chemistry so what I want to say must be put in the form of a question. Since we do have an example of a planet that manages to have the "right" temperature range due to a thin atmosphere—granted; for a freak *reason*—that does maintain the four elements we associate with life isn't it just possible to obtain same with a smaller planet—as above? Then suppose this is the Venus type atmosphere of $CO_2$ $NH_3$, nitric oxide, and organic chains. Isn't this the Earth, that Isaac Assimov described in his series of articles as it existed before life sprang *up*? It's only then that we get all that free nitrogen—as I recall for I don't have these articles handy. Also we did seem to have a lot of water from somewhere.

Connecting this with your previous article makes for revaluation, but not totally so, for I think that there are more handles than one to this particular frying pan.

David Elwell, B.A.

Dept. of Physics, Duke Univ.
Durham, N. C.

*It isn't just mass that determines gas retentions — temperature, density of planetary mass, distance from primary and/or other competing gravity fields —other factors all affect the result. Venus if at 20,000,000 miles from the Sun would probably be airless.*

## “FULLY IDENTIFIED . . .”

*continued from page 7*

requires that the spectrum be already known. This is a way to analyze an *unknown* material?

One microgram of cobaltamine—vitamin B-12—is considered a reasonably adequate vitamin supplement for that material. If an adult consumes one kilogram of food, plus an additional kilogram of water in a day, the concentration of that vital cobaltamine is 0.005 parts per million in his diet. You will, maybe, find this with an infrared spectrum?

Cancer, it is currently believed, arises from cells whose growth-regulating mechanisms have gone wrong—somehow the DNA-RNA information has been altered disastrously.

It is currently believed that virus particles are more or less loose DNA fragments, wrapped up in a protein capsule.

It's quite conceivable that the ultimate answer to cancer would be a highly specific virus that contained precisely the DNA codons that the cancer cells lacked—and attacked them, without, of course, bothering normal cells at all. (One class of thing you cannot learn is that which you already know. The cells that already have the codon information on self-restraint wouldn't “learn” anything from such a virus; the cancer cells would.)

If someone prepared such a virus, and submitted a highly active and adequate sample to the present AMA-FDA groups, it's evident that it would be reported as “fully identified as a solution of sodium chloride in water.” Virus particles in normal saline solution, concentrated to about $10^{-12}$ would be an extremely powerful solution . . . biologically!

Remember that it is inevitably necessary that I use analogies which you, the reader, already know the answers to. If I handed you an example, instead of an analogy, it would of course be meaningless! I can, for instance, hand you an example-for-a-1935-scientist, but it will be an *analogy* for you. Suppose I could borrow a time-transistor somehow, and slip back to the Bell Telephone Laboratories, in 1935, and hand them a collection of a few modern solid-state devices. Say a silicon diode rectifier, half the size of a golf ball, rated at 150 amperes, 400 volts peak inverse. (That would drive the power-supply division into a flying frenzy!) And a grown-crystal audio-amplifier unit, with grown-in solid-state resistors, capacitors and transistors, half the size of a pea. A simple little semi-microscopic germanium diode detector, too, and perhaps be very generous and supply a couple of the new silicon carbide lasers. (“You put in the juice here and here, and the coherent beam of blue light comes out *here.*)

Let us now stand back and watch the chemists try analyzing that stuff. That silicon rectifier, now . . . they'll find it's a single crystal of pure silicon. They haven't got a technique good enough to come close to guessing *how* pure. (None of their reagents, or the water they're using to analyze it, are pure enough anyway; the techniques for getting commercially usable quantities of conductivity water weren't developed until transistor work forced them into use.) And since they can't come close to the purity of the silicon, they can't possibly detect the doping impurity that makes it work. They won't do it with a spectroscope, either—partly because they don't know how to get a spectroscope clean enough to do any good! The “background noise” of contaminants in their reagents, their equipment, and the atmosphere they work in would conceal the doping impurity.

A large part of the work the Bell Labs did in the years after they did invent the transistor was concerned with developing techniques for getting clean tools, clean reagents, clean equipment, which made possible the modern transistor. It wasn't just the concept of the transistor they developed; Bell Labs had to develop a whole new chemical and industrial concept to make production possible.

“Zone refining” was one of those—a technique whereby already ultra-purified germanium, silicon, or other material could be super-ultra-refined.

Back around 1940, the people working with copper oxide rectifiers at Bell Labs and other electronics industry research centers, knew that copper from a certain area in Chile made the best copper oxide rectifiers. Montana copper wasn't as good, nor was African or Mexican.

Yeah—sure—everybody knows that copper is an element, and an element is an element, and where it comes from has nothing to do with the matter. And in the days before knowledge of the “doping” behavior of semiconductive materials was available, who knew that a small-fractional-part-per-million impurity could make a huge difference?

The labs had tried analyzing the Chilean copper; they were perfectly sure that there was *some* impurity present. But no technique known to science as of 1940 was able to detect it.

After the information was of no practical significance—copper oxide rectifiers having been entirely displaced by silicon and germanium diodes—techniques developed in transistor research made it easy to determine the impurity. Zone refining, for instance, can sweep all the impurities on a bar of germanium—or copper—down to one end, thus concentrating them neatly for analysis. But by then, of course, it had become a completely academic question. . . .)

However, if someone says something like that business about only Chilean copper being good for the device he's invented . . . he almost certainly wins himself, right there, the “Strictly Crackpot!” label.

On the other hand, when the AMA and FDA proudly announce that they have completely identified a previously unknown remedy because they've identified the infrared spectrum of one component . . . that, sir, is Science at Work!

Pardon me while I go back to Magic.

The magicians used to try something out before they decided whether it worked or not. ■ The Editor

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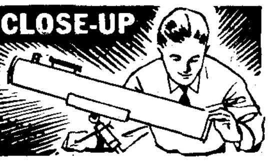

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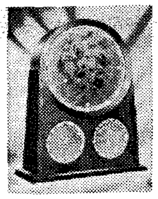

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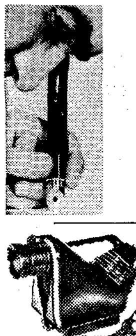

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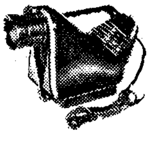

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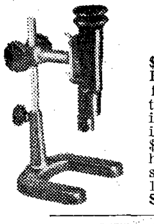

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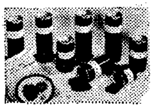

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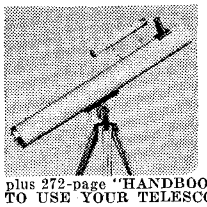

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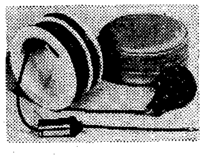

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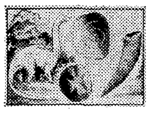

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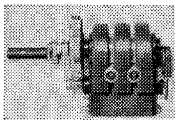

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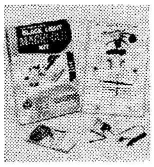

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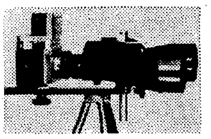

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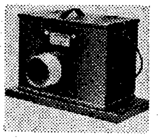

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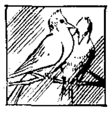

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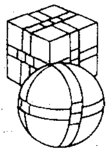

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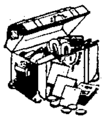

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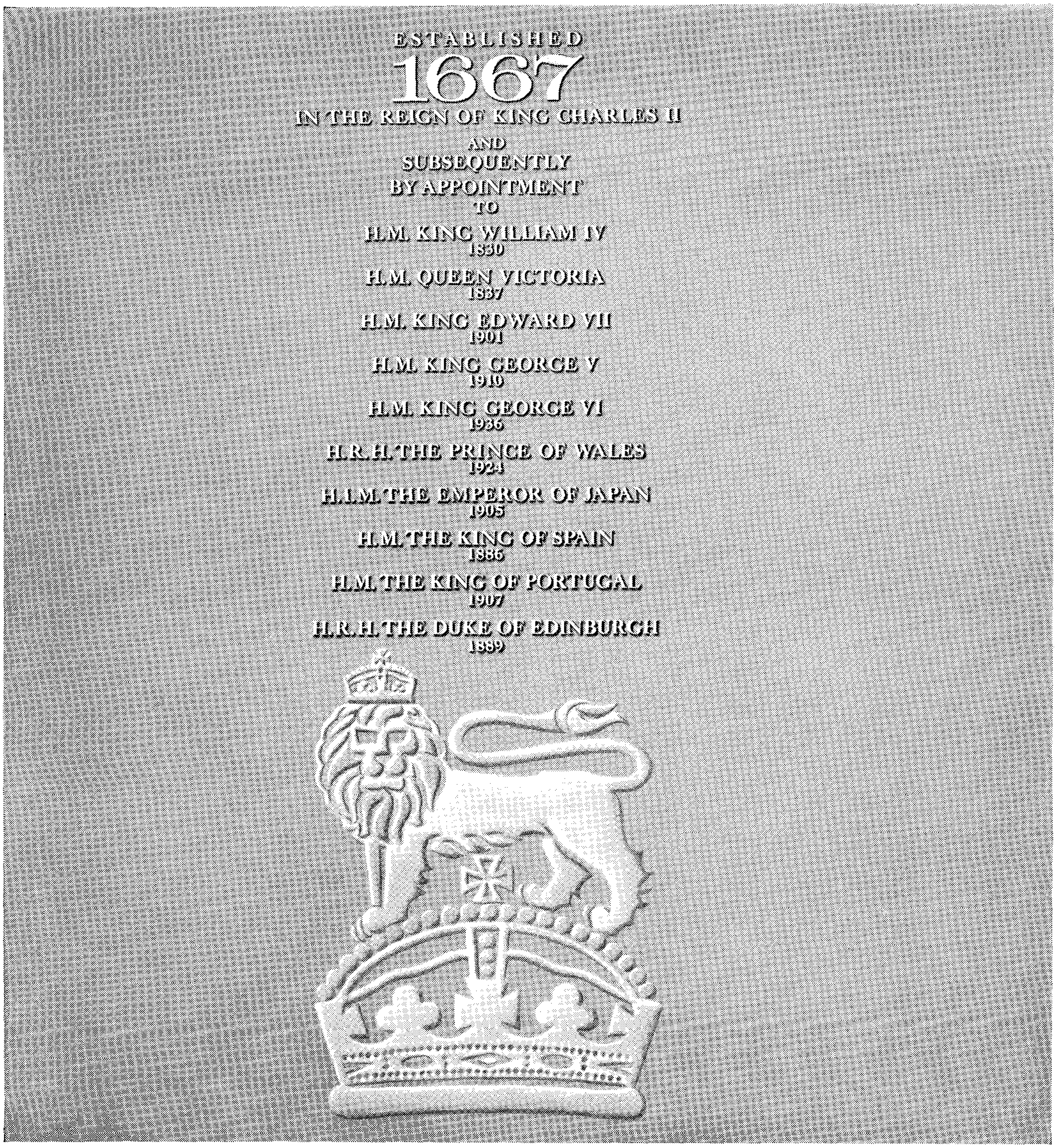

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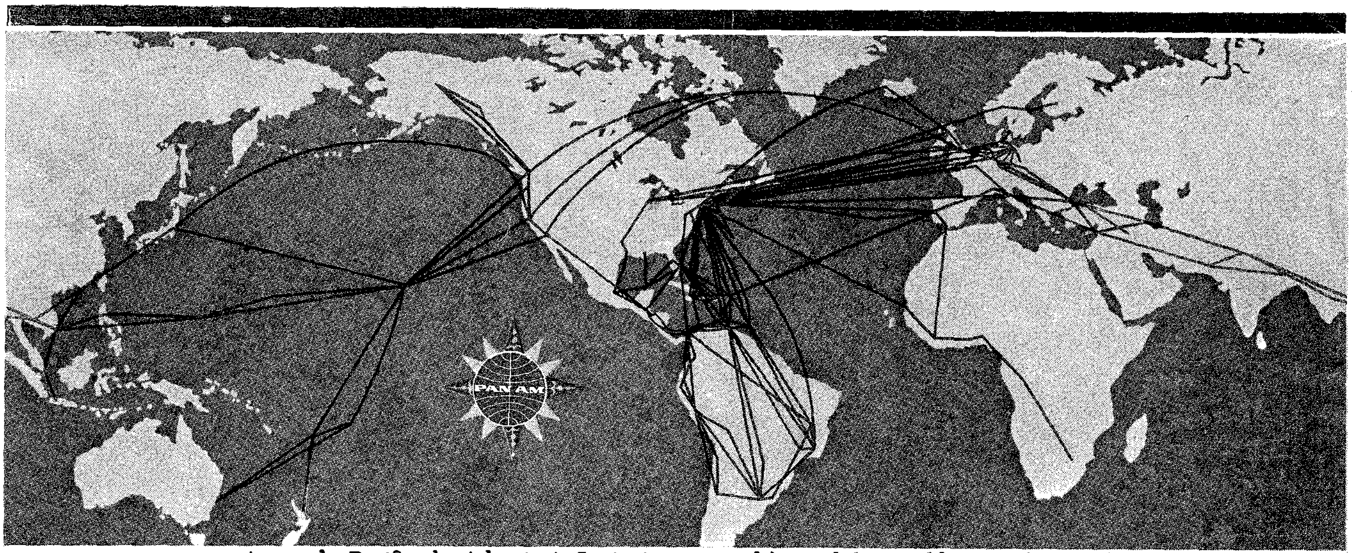

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